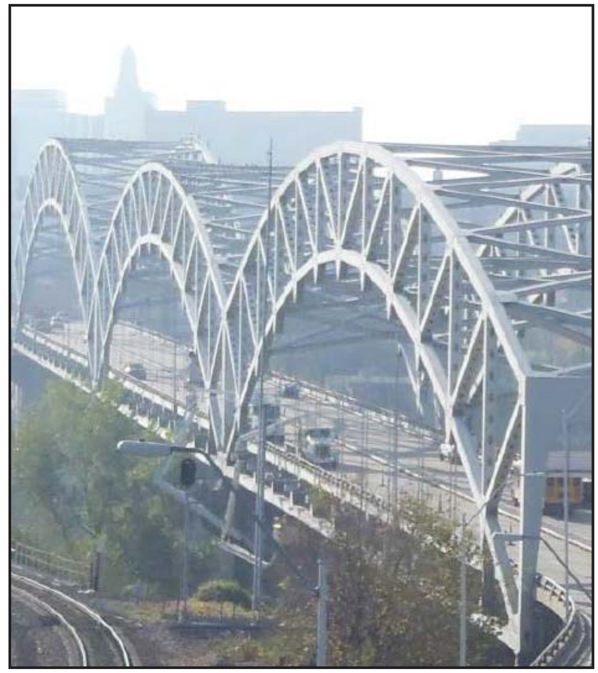
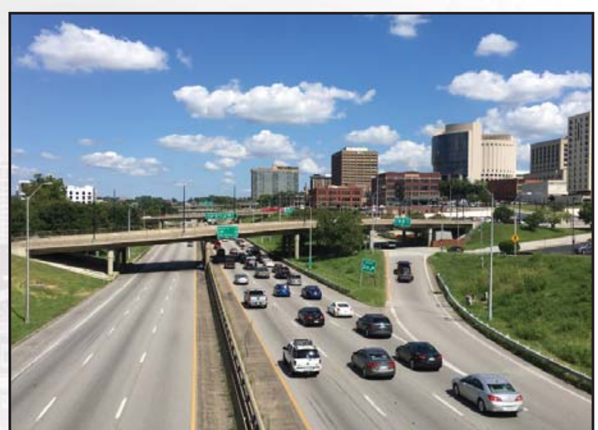
BEYOND THE LOOP

Chapter 2:
TRANSPORTATION CONDITIONS

The proposed improvement strategies identified during the PEL Study will be evaluated relative to their ability to address deficiencies in the existing transportation system. Transportation and existing infrastructure items addressed in this chapter specifically include: roadway and bridge conditions, traffic conditions, safety, transit, bicycle and pedestrian facilities and operations, Missouri River navigation, railroads, the Downtown Airport and utilities. Within the Study Area, a number of these infrastructure items have been examined, including::





Roadway and Bridge Conditions

- What are the existing bridge ratings?
- What are the existing pavement conditions?
- What are the existing lane widths, shoulder widths, and other potential geometric deficiencies for the roadway lanes, shoulders and ramps?
- What are the acceleration and deceleration ramps that present conflict points?

Traffic Conditions

- What are the existing traffic volumes based on average annual daily traffic (AADT), as well a.m. and p.m. peaks?
- What are the major traffic movements and distribution?
- What are the travel speeds and what are the key movements, as well as bottlenecks?
- What are the levels of service (LOS)?
- What are the travel times for moving through the Study Area?
- What are the key truck movements and average daily traffic (ADT)?
- What are the total vehicle miles traveled (VMT), total delay and other regional traffic measures of effectiveness within the Study Area?

Safety

- What is the total number of crashes and their severity?
- What are the average crash rates and how do they compare to the statewide average?

- What are the most common causes for crashes?
- Where are the specific locations that have high crash rates?

Transit

- What are the local bus, MAX bus and streetcar routes?
- How do these routes interact within the Study Area?
- What is the demand for transit service to the Northland and other areas?

Bicycle and Pedestrian Facilities

- What are the existing bicycle and pedestrian facilities?
- What are the existing bicycle and pedestrian problems?
- How do these facilities interact within the Study Area?
- How many people are using the bicycle and pedestrian facilities?

Missouri River Navigation

- What are the design requirements that bridges on the Missouri River must meet to accommodate navigation?
- Where is the navigation channel?
- What are the navigation facilities within the Study Area?
- What is the navigation season?

Railroads

- Where are the rail facilities located within the Study Area?
- Who operates the rail facilities?

Airspace

- What are the airspace and runway requirements for the Downtown Airport and how do they impact the bridge?

Utilities

- What are the major utilities?
- Where are the utilities located within the Study Area?

Buck O'Neil Bridge

MoDOT completed an extensive inspection and rehabiliation report of the O'Neil Bridge in March of 2017. The inspection identified numerous structural deficiencies in need of rehabilitation or replacement. Condition assessment of the trussed-arch spans, approach spans, and supporting elements are summarized below:

- Trussed-Arch Spans – Significant deterioration of structural steel has occurred at truss elements, gusset plates, connectors, bearings and steel stringers that support the roadway. Corrosion and deterioration are most prominent near roadway expansion joints where supporting elements are exposed to roadway drainage, but also occur throughout. Many of these elements need to be repaired or replaced. In addition, fatigue retrofits, painting and repairs to hanger assemblies are needed to prolong the life of the existing structure. Likewise, condition of the roadway deck and expansion joints warrant replacement of these items.
- Structural Steel – The sections with the most severe bridge deterioration occur at stringer ends of the main spans, keeper plates, and floorbeam webs. Ends of steel stringers that support the roadway deck are exhibiting serious deterioration and section loss due to long-term exposure to chloride contaminated runoff from the deck through open joints and curbs. Cracking also occurs in the stringer webs. The stringers are supported on steel plate bearings which are also deteriorating with extensive pack rust between the steel plate bearings and bottom flange of the stringers. Section loss occurs in top and bottom flanges of the floorbeams. Pitting in the floorbeam webs occurs throughout. Pack rust occurs between stiffening angles and floorbeam webs, with holes occurring in the floorbeam stiffening angles. Tie girders at the arch spans have pack rust between top plates and connecting angles which causes cupping and bowing of the top plates. Localized areas of pitting also occur on the tie girders. Portal frames, box members and gusset plates all have pack rust between plies of steel and deterioration.
- Suspender Cable Keepers – At each of the cable supports on the mains spans the lower sockets of the cables are retained by keeper angles. These angles were attached with tap bolts to the socket bearing plate. Pack rust has formed between the keeper angles and the bearing plates at most locations. The pack rust is prying the keeper angles away from the bearing plate, and in some instances the bolts have failed and the keeper angles are no longer in place.
- Expansion Joints – The finger plate expansion joints at each end of the main spans have no drainage collection system. This allows roadway drainage to flow onto underlying structural steel and pier tops. Although vertical misalignment has occurred at the joints, the finger plates are in satisfactory condition, but the supporting steel structure below is deteriorating. Pack rust, deterioration and broken clip angles occur at the joint support brackets. Compression seal joints at contraction joint locations have failed in all main spans. Filler material in the compression seals is missing and armoring is missing or damaged, again allowing roadway drainage access to structural steel elements below.
- Bridge Deck – The existing bridge deck has a low slump overlay on top which has numerous cracks in both the transverse and longitudinal directions, and deterioration near drain locations. Stay-in-place forms underneath the deck exhibit bulging in some places. The overlay above and deck forms underneath hinder crack detection in the actual deck. Based on reported visual observations, it is estimated that half-sole repairs are required on 20%, and full depth repairs are required on 15% of the deck area. Deck saturation also occurs in the north approach spans.
- Railing – The railing has numerous locations where vehicular impact has caused damage, including bent and broken rail tubes and broken rail posts. Curbs and parapets supporting rail posts are corroded and spalled. Pack rust is also prevalent on steel curb support brackets.

Top Picture
Buck O'Neil Bridge is a trussed-arch bridge that carries four lanes of traffic over the Missouri River, Union Pacific Railway, BNSF Railroad, 3rd Street, 4th Street, Woodswether Road and Richards Road

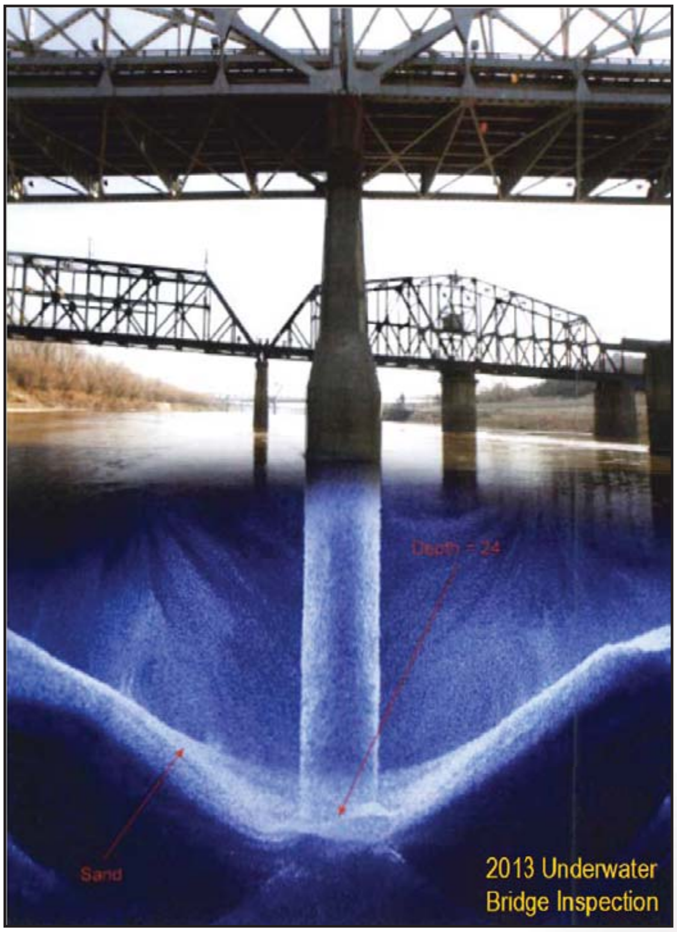
Middle Left
Typical deterioration at steel elements

Middle Right
Pack rust at stringer bearing plates

Bottom Left
Broken retainer angle at suspender cable socket

Bottom Right
Deterioration at expansion joint support

- Main Span Piers and Scour — A significant scour hole up to 24 feet deep is present at Pier 2. Pier 2 is located near the middle of the river at the north end of the 540-foot navigation span. The scour occurs on all sides of the pier. The pier is embedded approximately 1 foot into shale. Faces of the piers are in generally poor conditions. Areas of delamination and spalls occur on the faces and corners. Elevated chloride content occurs in the concrete.
- Approach Span Piers — Pack rust occurs between flanges and connecting angles, and end plates and connecting angles at the approach piers. Localized concrete spalling also occurs.
- North Approach Spans — Systemic cracking of the girder webs occurs at the ends of stiffeners. Cracking can primarily be classified as distortion induced fatigue cracking. Some of the cracking has propagated into the webs. Monitoring has shown the cracks continue to grow over time.



Top Left
Underwater sonar investigations have identified a significant scour hole at Pier 2

Top Right
Deck cracking in overlay

Middle Right
Concrete spalling along the shoulders

Bottom Right
Extensive corrosion at the approach piers

Other Study Area Bridges

Reports on the most recent bridge inspection and bridge ratings in the Study Area were reviewed. 2015 National Bridge Inventory System (NBIS) data was obtained for structures in Kansas. Missouri splits the inspection of its structures into a two-year cycle and the data includes records from both 2015 and 2016. NBIS bridge condition ratings were reviewed for 26 bridge structures located in Kansas and 86 in Missouri. NBIS data consists of three separate rating areas: bridge deck, bridge superstructure, and bridge substructure. A 1 to 10 rating scale is used for each component, and a general assessment of good is assigned to ratings 7 through 10, fair to ratings 5 and 6, and poor to a rating of 4 or less.

Figure 2.1 shows current NBIS ratings for all bridges in the Study Area. Six structures have one or more ratings of 4 or less and are indicated as poor. Bridge B0031 carrying I-70 over the Kansas River is in the final states of plan development and KDOT received construction bids in November 2017.

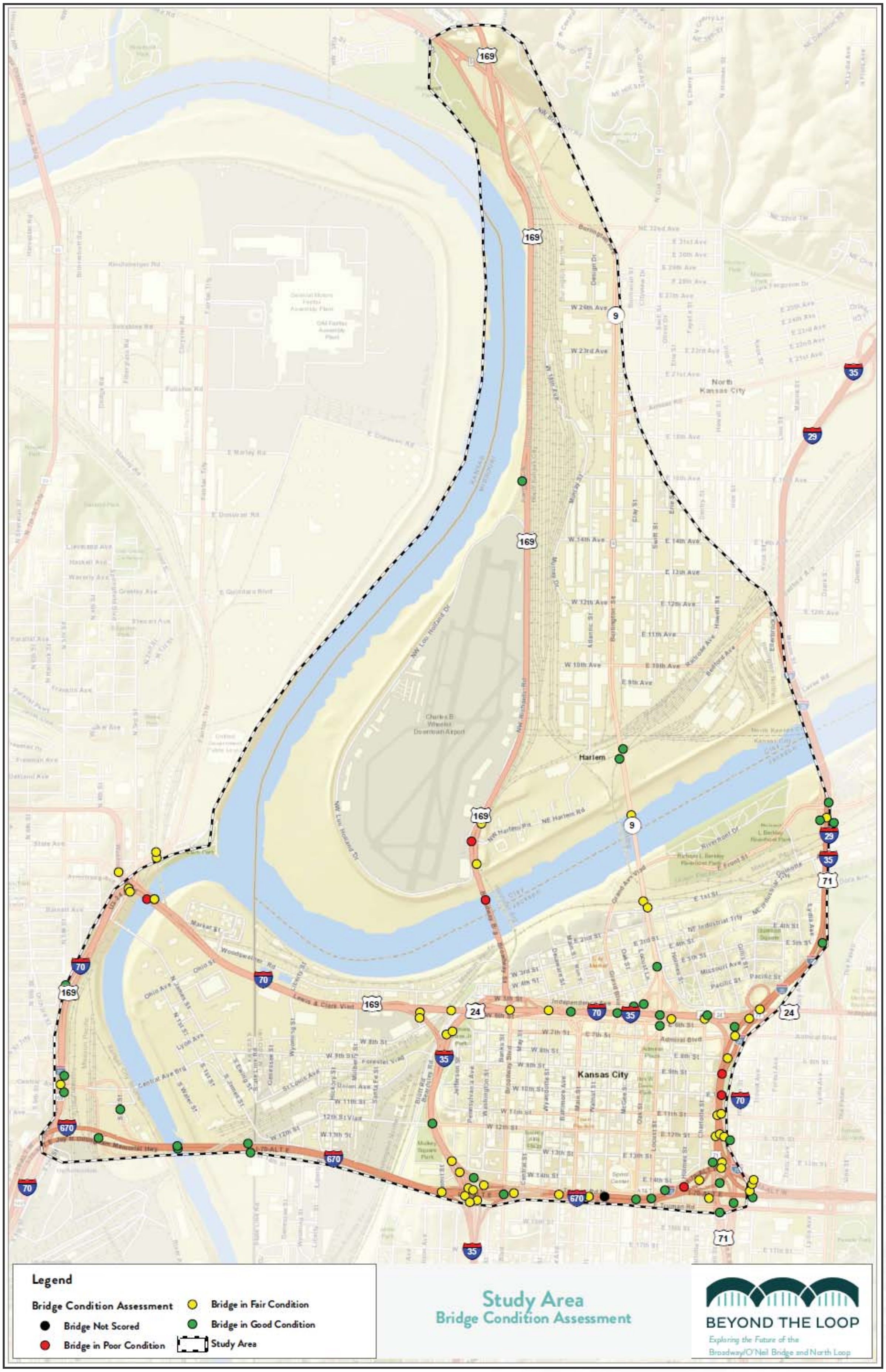
The structures with poor ratings include those listed in Table 2.1 below:

Table 2.1 -Study Area Bridges with Poor NBIS Ratings

Owner	Bridge No.	Carrying	Spanning	Deck Rating	Superstructure Rating	Substructure Rating
KDOT	B0031	I-70	Kansas River	7	4	5
MoDOT	A0825	Holmes Road	Ramp I-670 E to I-70 W	3	3	7
MoDOT	A4646	Route 169	Harlem Road	6	4	7
MoDOT	A4649	Route 169	Missouri River	5	4	5
MoDOT	L0938	9th Street	I-70	3	3	6
MoDOT	L0939	10th Street	Ramp I-70 E to 11th Street	3	3	5

Six bridges in the Study Area, including the Buck O'Neil Bridge are considered in poor condition.

Figure 2.1 - Existing Bridge Condition Ratings



Pavement Conditions

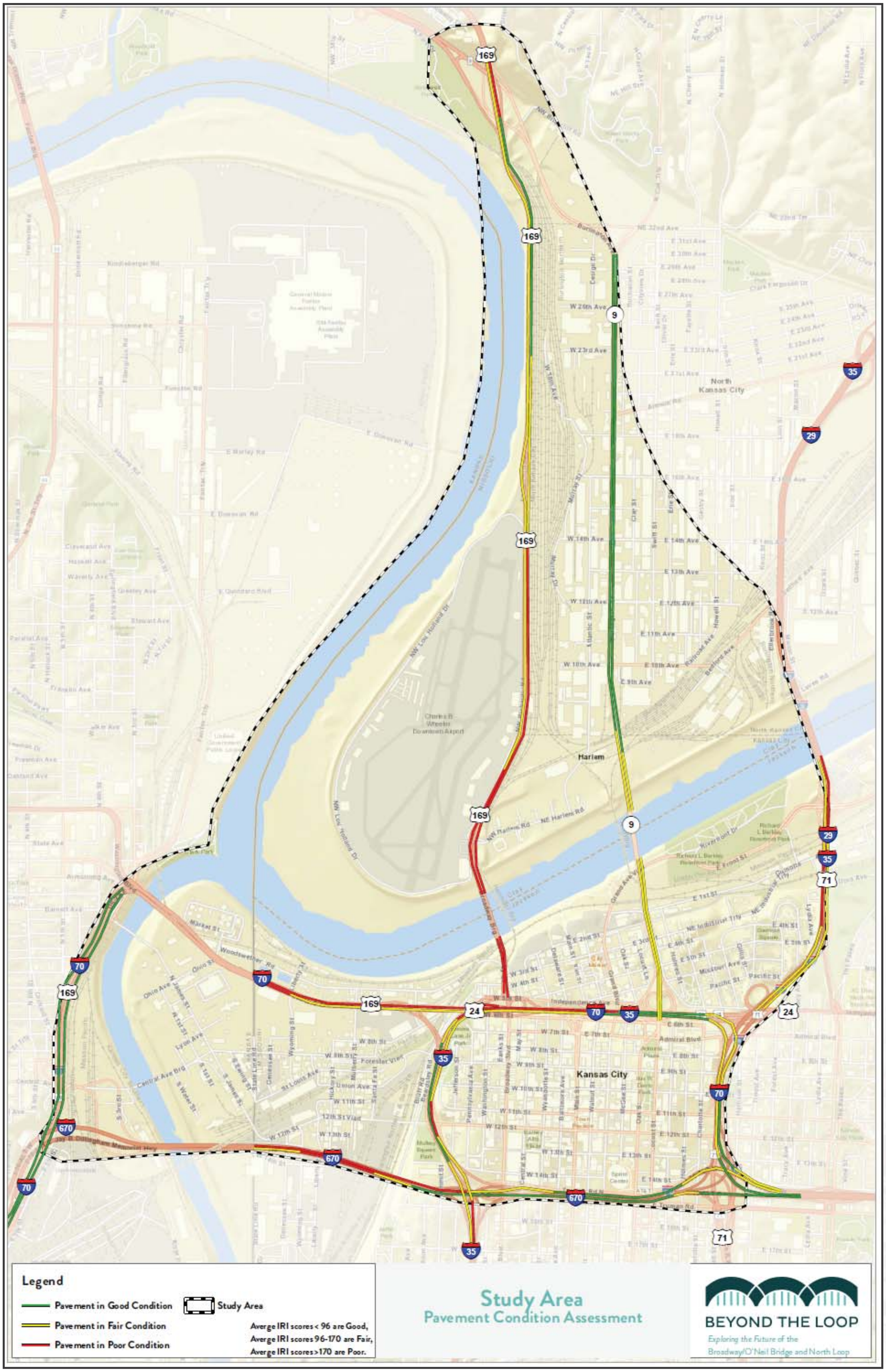
Both Kansas and Missouri use the International Roughness Index (IRI) as the primary method to assess pavement smoothness. IRI measures the roadway profile in a single-wheel track, and is reported in inches per mile. IRI is a valuable tool in assessing pavement smoothness but does not gauge other pavement condition characteristics such as pavement stability and soundness. The condition of the sub-grade that provides the platform for the pavement was not assessed as part of this study.

General parameters established by the Federal Highway Administration for IRI are segmented as follows:

- IRI value of 95 or less is considered good.
- IRI value of 96 to 170 is considered acceptable.
- IRI exceeding 171 is considered poor.

Several segments of highway in the Study Area have roadway pavement conditions considered “poor.” Figure 2.2 identifies those areas in red and includes most of US-169, most of the I-70 Loop, and sections of I-670.

Figure 2.2 -Existing Pavement Conditions



Geometric Deficiencies

The project team investigated existing lane widths, shoulder widths, and horizontal curvature to compare with the currently desired design guidelines established by AASHTO. Significant deficiencies were found to exist in the following four areas:

- Mainline Shoulder Widths — The existing shoulder width on most of the interstate system is less than the current AASHTO design guideline recommends. Figure 2.3 illustrates the outside shoulder width compared to the desired design and Figure 2.4 notes the inside shoulder width.
- Ramp Shoulder Widths — The existing shoulder width on most of the ramps is less than the current AASHTO design guideline recommends. Figure 2.5 illustrates the outside shoulder width for ramps in the Study Area compared to the desired design. Figure 2.6 notes the inside shoulder width for ramps.
- Ramp Curvature — Many of the existing ramps have a horizontal curvature below the current design guideline. The horizontal curvature was rated as meeting the current design guideline, nearly meeting the guideline, and below current design guidance. Figure 2.7 illustrates the ramps in the Study Area and an assessment of horizontal curvature.
- Acceleration and Deceleration Lanes — Most of the acceleration and deceleration lanes provided for ramp movements do not meet current design standards for desired length. Additionally, nine locations within the Downtown Loop have a shared-use acceleration/deceleration lane, with seven of the nine locations using a shared lane that is less than a desired minimum of 1600 feet. The short length and shared function of the acceleration and deceleration lanes impacts travel efficiency and adds conflict points for weaving traffic. Figure 2.8 illustrates current acceleration and deceleration lane lengths in comparison to the recommended design length established by AASHTO for ramp movements in the Downtown Loop.

Figure 2.3 - Outside Shoulder Widths

Figure 2.4 - Inside Shoulder Widths

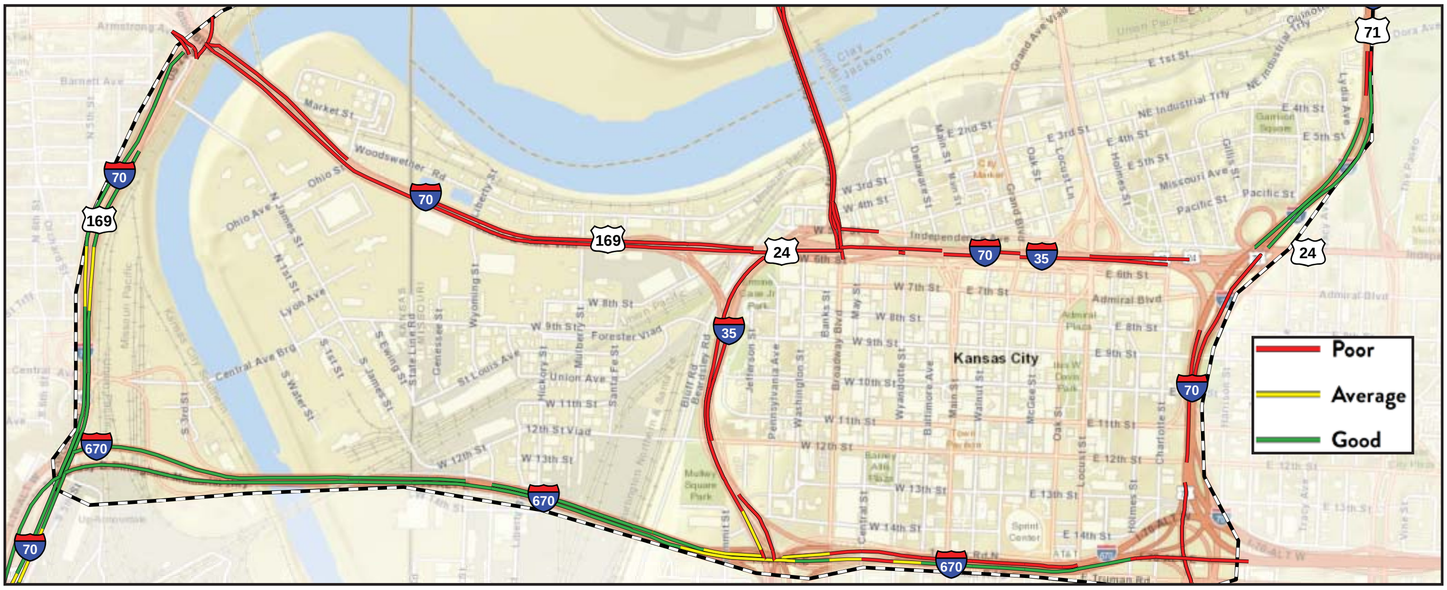


Figure 2.5 -Outside Ramp Shoulder Widths

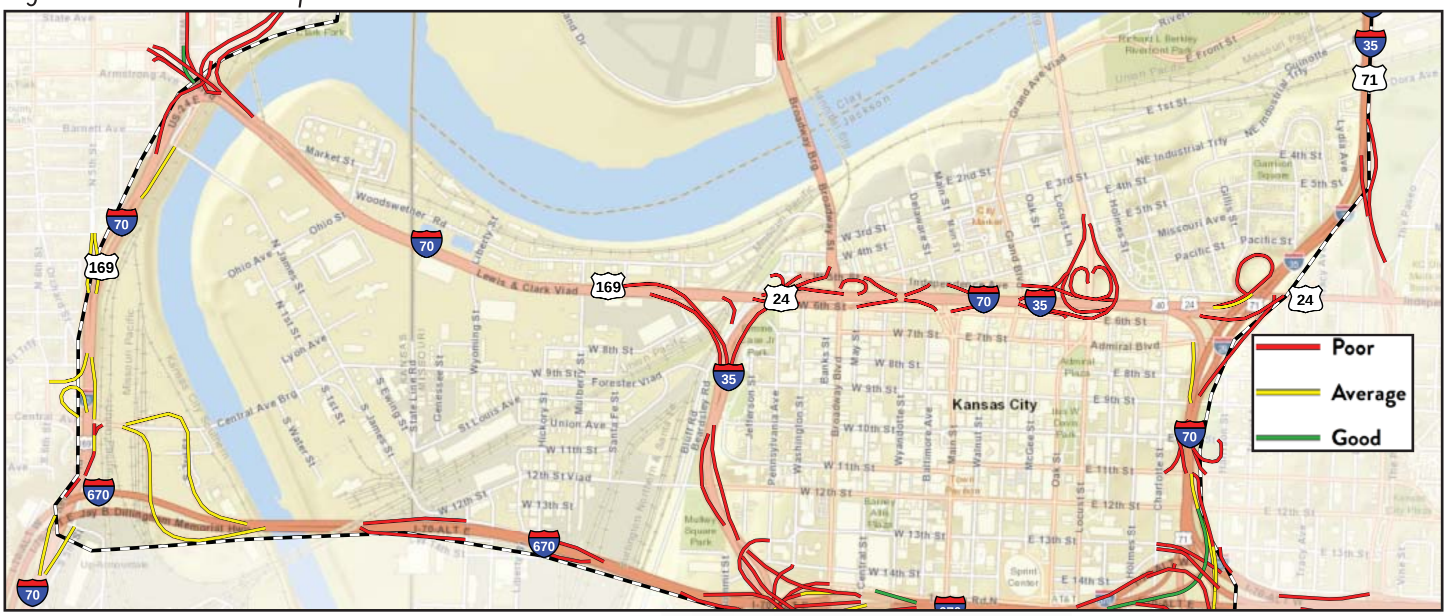


Figure 2.6 - Inside Ramp Shoulder Widths

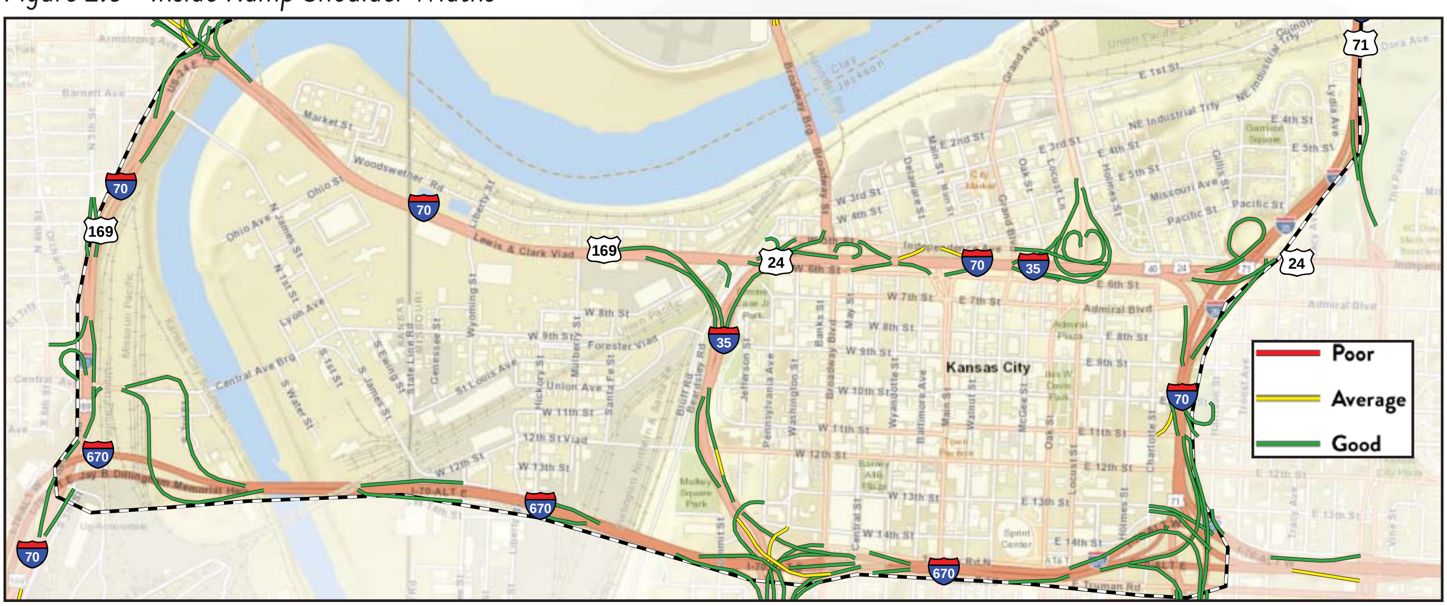


Figure 2.7 - Ramp Radii

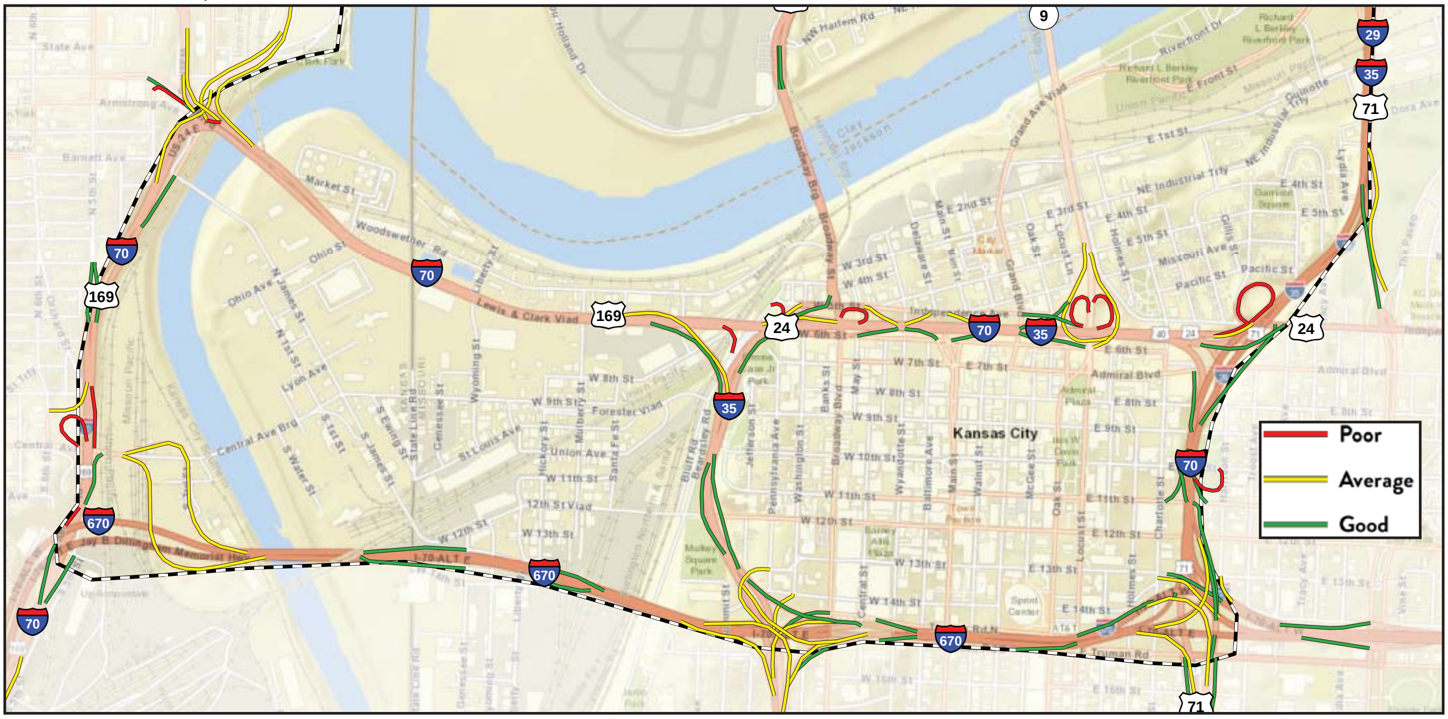
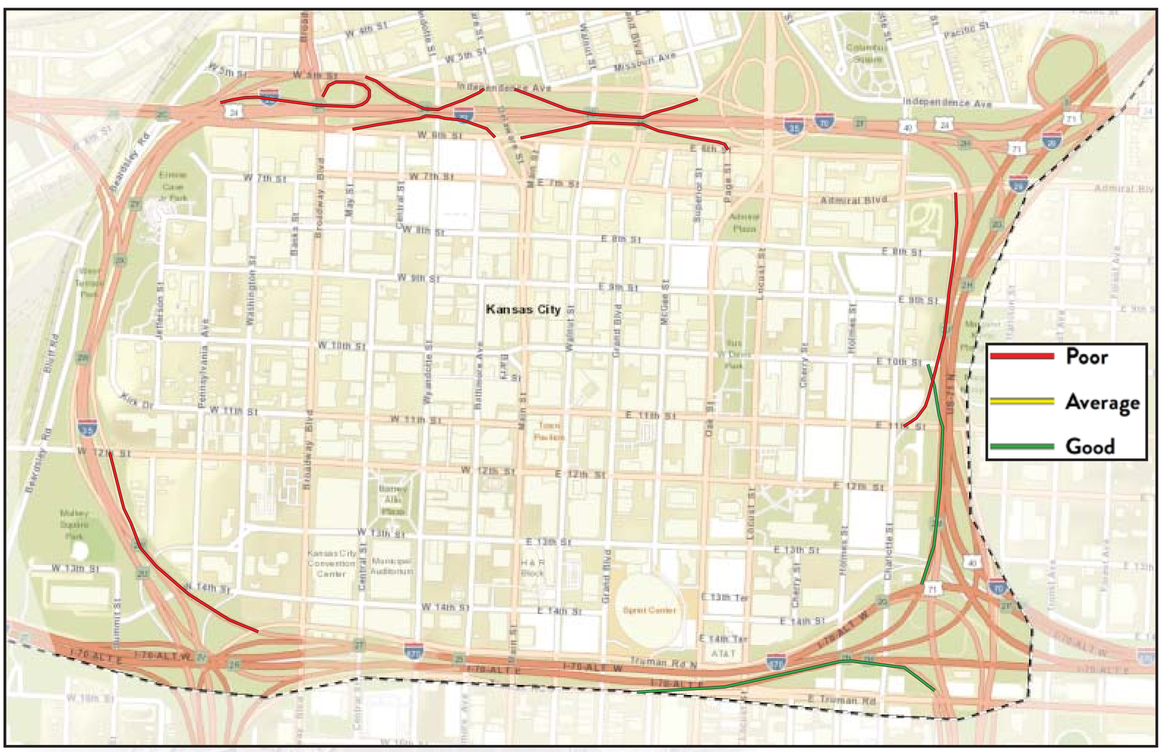


Figure 2.8 - Acceleration and Deceleration Lanes Lengths



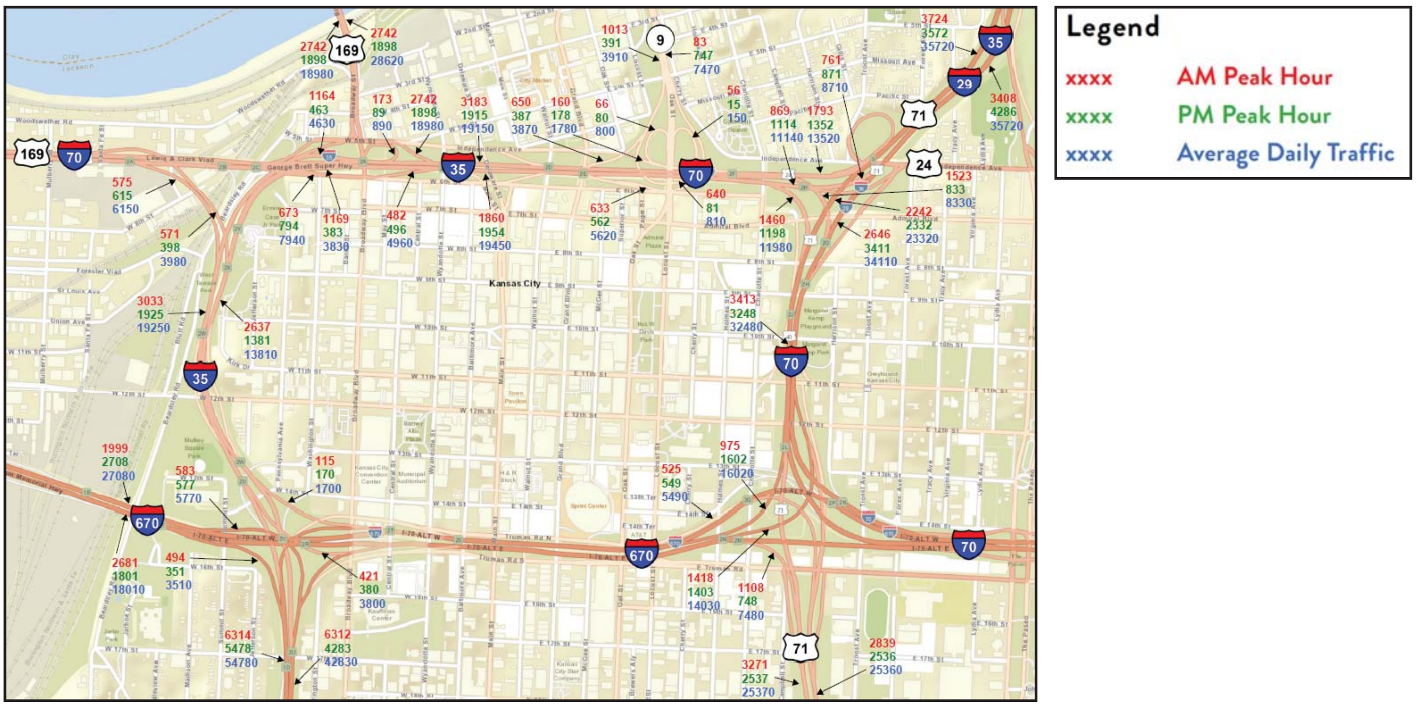
TRAFFIC CONDITIONS

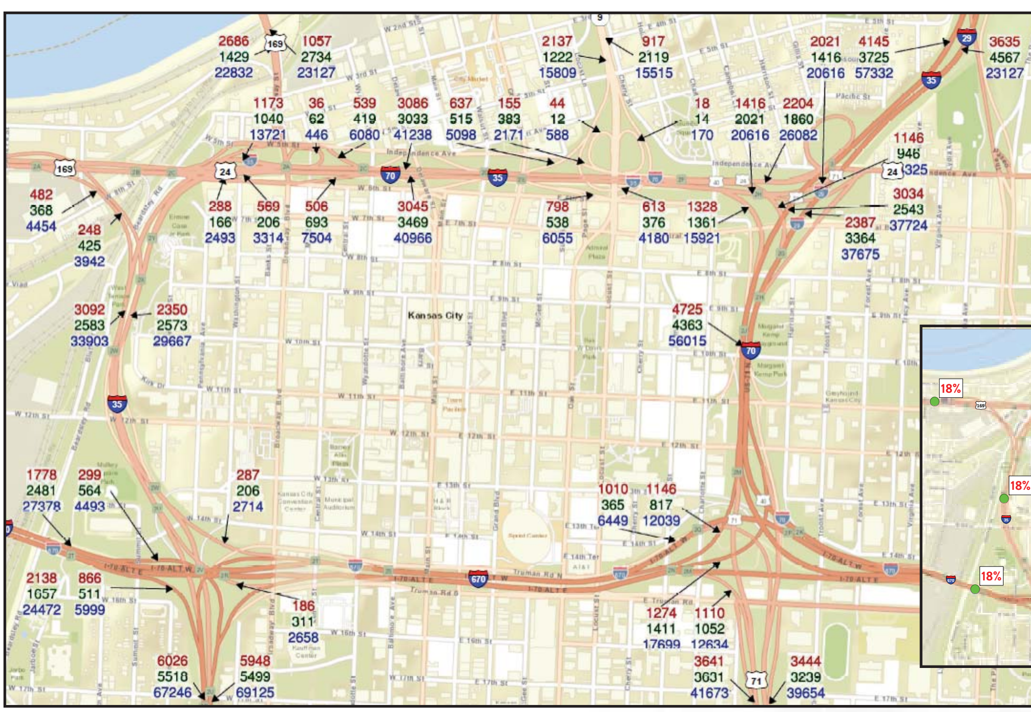
This section presents the existing Study Area traffic operational conditions, including travel volumes, LOS, travel speeds and travel times, and typical origins and destinations.

Travel Volumes

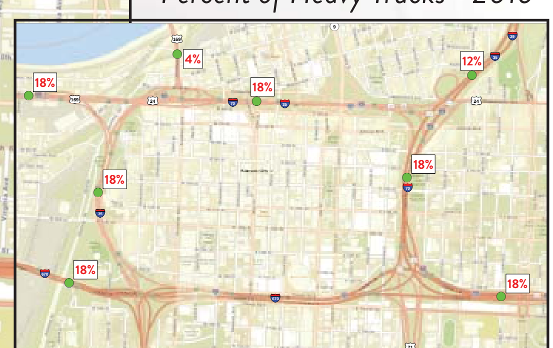
MoDOT's continuous counters provided the vehicular traffic counts. The counts were collected during the a.m. and p.m. peak periods and daily on weekdays between January 25, 2017, and April 19, 2017. The truck average annual daily traffic count information is from MoDOT's vehicle count map. Note that truck percentages on interstates in the downtown Kansas City area are relatively high at around 18 percent in most locations.

Figure 2.9 - Average Annual Daily Traffic (AADT) and AM/PM Peak Period Traffic - 2016 (top) & 2040 (bottom)





Percent of Heavy Trucks - 2016



Travel Level of Service

Level of Service (LOS) describes overall roadway operations and the traveler's ease of making appropriate maneuvers. Below is a description of the A-F ranking scale for LOS and example images are shown to the right.

- LOS A describes free-flow, uninterrupted traffic conditions.
- LOS B indicates slightly restricted maneuverability that closely resembles free-flow operations.
- LOS C represents slightly restricted traffic flows that noticeably differ from free-flow conditions.
- LOS D describes the point in which traffic speeds begin to decline due to increased traffic.
- LOS E indicates heavy congestion in which the roadway is operating at capacity.
- LOS F represents a breakdown of traffic flow resulting in excessive queues.


LOS A


LOS B


LOS C

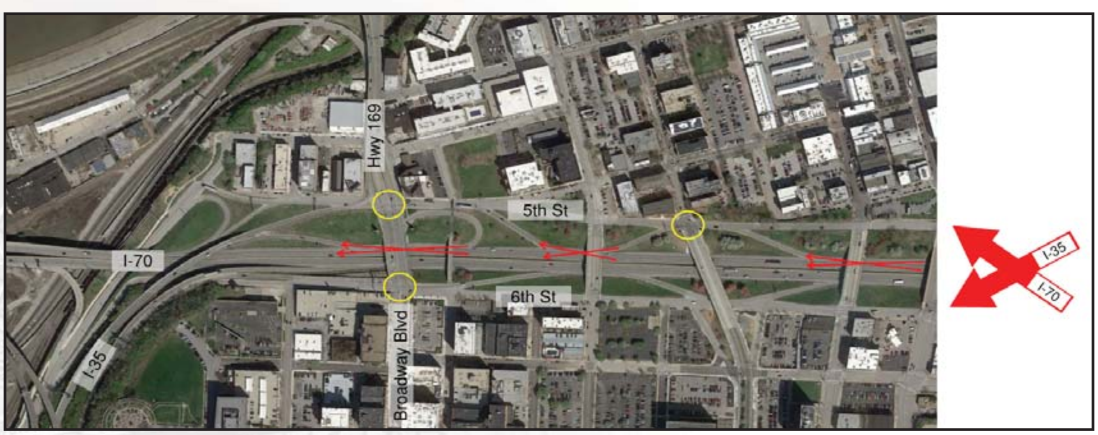

LOS D


LOS E


LOS F

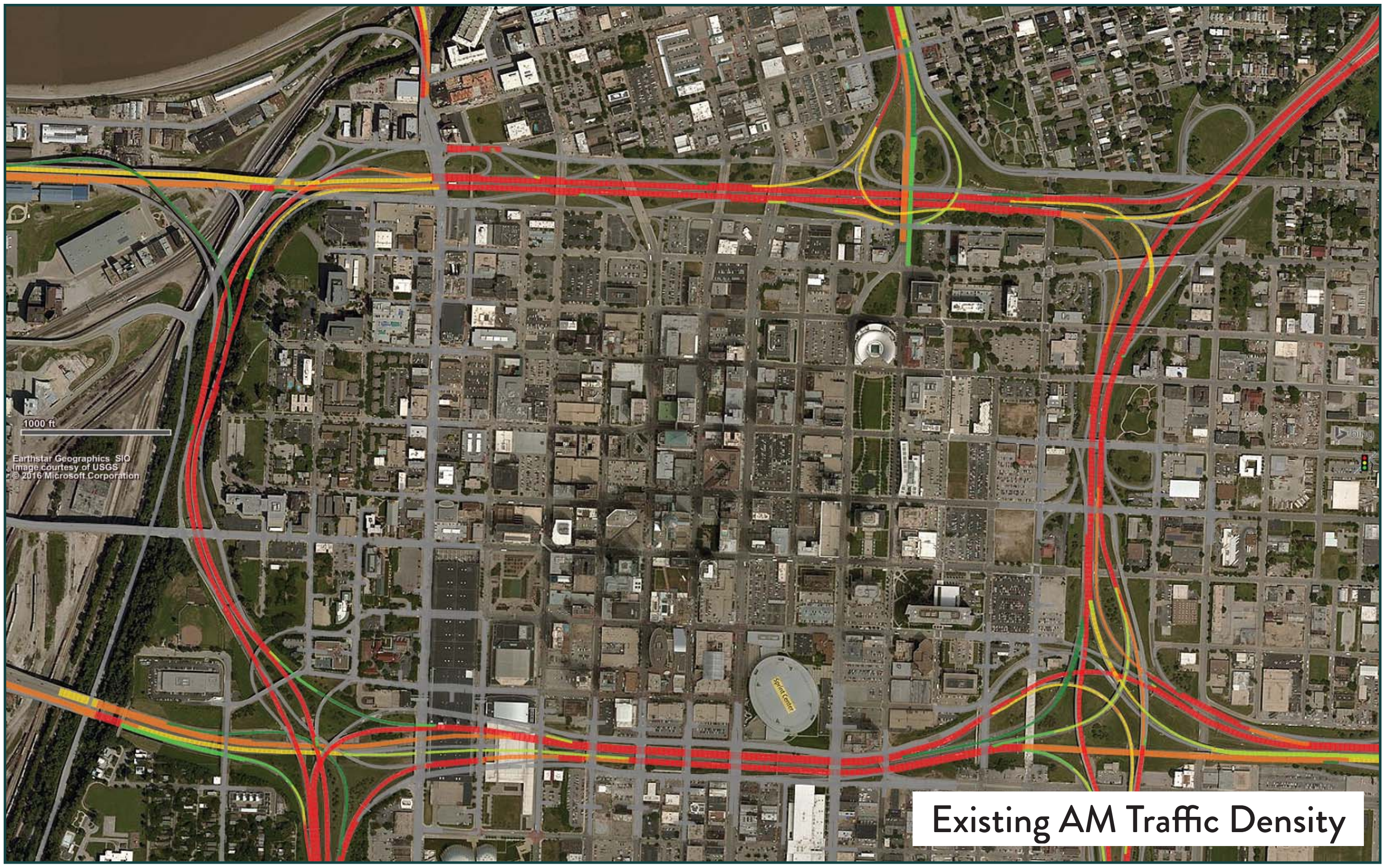
The Downtown Loop was designed and built to the standards of its day; however, that was a long time ago. Modern interstate highways have much different design standards. Designs once considered acceptable have now become undesirable in facilitating higher traffic volumes. The overwhelmed designs are evident throughout the Downtown Loop, especially along the entrance and exit ramps on the north and east sides of the Loop.

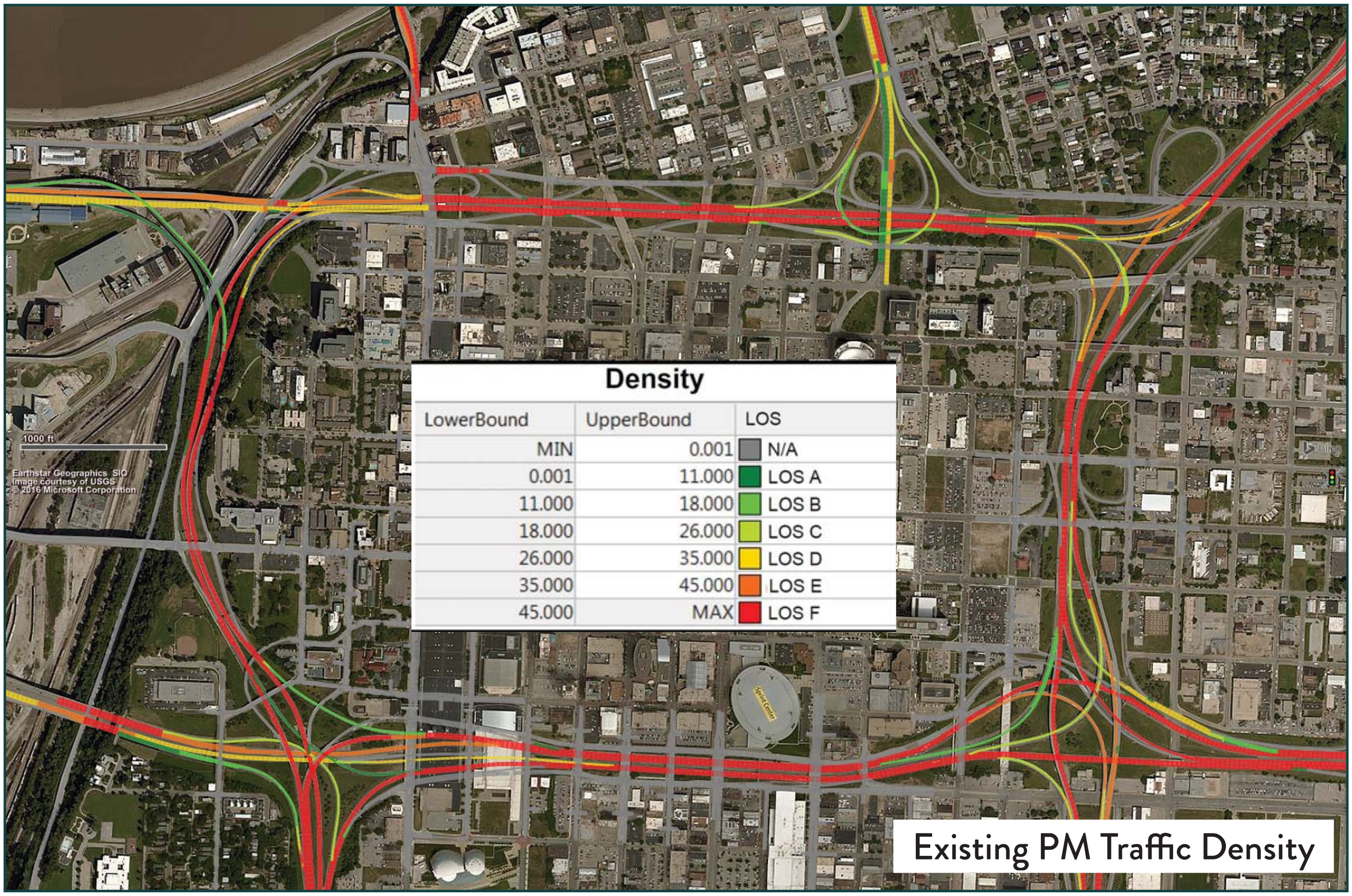
Closely spaced on and off ramp configurations often result in a weaving behavior that requires the crisscrossing of traffic on the highway (graphic below). Weaving areas are often the largest source of traffic congestion with the effect compounded when multiple weave areas are too close to one another or overlap. Other influencing factors on weaving segments include upstream traffic signals which could affect the grouping of vehicles entering the highway. Closely spaced vehicles entering the highway at once often result in a ripple effect that further degrades traffic operations. Modern design practices try to limit interactions on weaving segments. Figure 2.10 on the following page identifies the roadway segments experiencing unacceptable LOS in both the a.m. and p.m. peak periods.



There are four overlapping, undesirable traffic weaves on westbound I-70 along the North Loop. These overlapping weaves drastically reduce traffic operations in this area.

Figure 2.10 - Level of Service Density (2016 VISSIM Model Output)

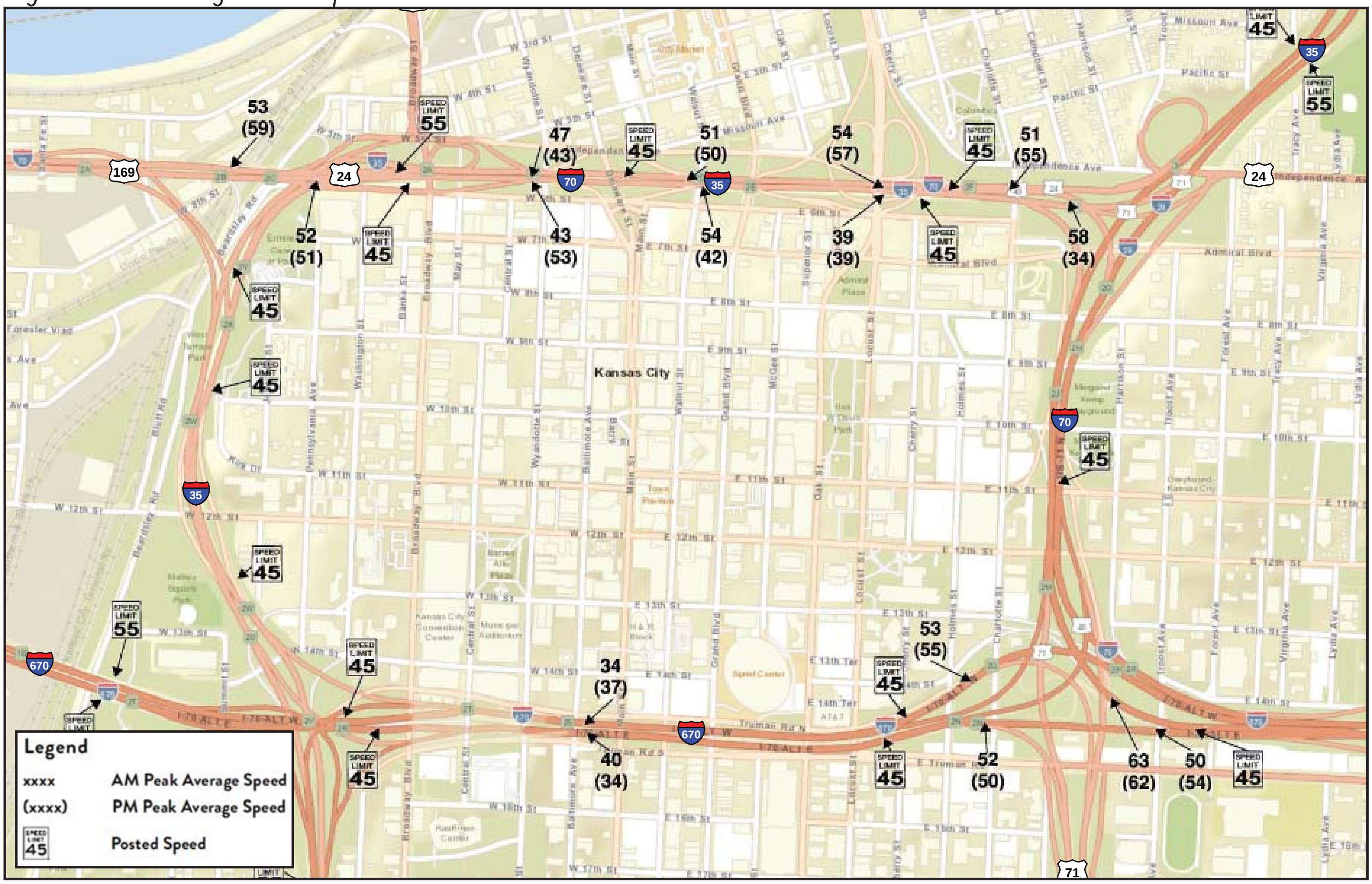




Travel Speeds and Travel Times

KC Scout maintains sensors around the Downtown Loop that record travel speeds constantly, every day throughout the year. This information was gathered for the a.m. and p.m. peak hours during weekdays (Tuesdays, Wednesdays and Thursdays) for April through August, 2017. The averages for all the speeds collected are shown on Figure 2.11. The posted speed limits shown on the figure are the actual posted speed limits.

Figure 2.11 - Average Travel Speeds - 2016



Travel Origins and Destinations

The Downtown Loop is Kansas City's largest generator of daily traffic. Understanding the travel patterns of the Loop's traffic is an important factor for this study. Origin-Destination (O-D) pairs were analyzed for both a.m. and p.m. peak hours and were summarized into three types: system-to-system movements, system-to-central business district (CBD) movements, and CBD-to-system movements. System-to-system movements are movements from a major roadway, an interstate or limited-access highway, to another major roadway. For the purposes of the O-D data collected, these were the longest trip types, with the trips starting and ending outside the study area. System-to-CBD movements, and similarly CBD-to-system movements, were trips that started on a major roadway and ended at the CBD. The CBD-to-system were the reverse trip, or a trip starting at the CBD and ending on a major roadway.

O-D pairs were collected through a series of high-definition aerial photographs in which every 10th vehicle entering the study area on a major roadway was tracked to determine vehicular routing and estimated volume. Vehicles were tracked from entry of the designated zone until exiting the designated zone which encompassed the entirety of the downtown Kansas City highway Loop system. The extents of local roadways of downtown inside the highway Loop system were not assessed in this procedure.

Approximately 38% of all a.m. traffic entering the perimeter of the Loop on a major roadway is destined to the Loop. That number falls to 19% in the p.m.. In the opposite direction, in the morning 12% of the traffic is from the Downtown Loop and 30% in the p.m. Figure 2.12 identifies the top five movements into and out of the CBD during the a.m. and p.m. peak. Figure 2.13 identifies the top five external to external movements through the Downtown Loop.

Figure 2.12 - Five Largest External to Internal or Internal to External Movements (AM & PM Peaks) - 2017

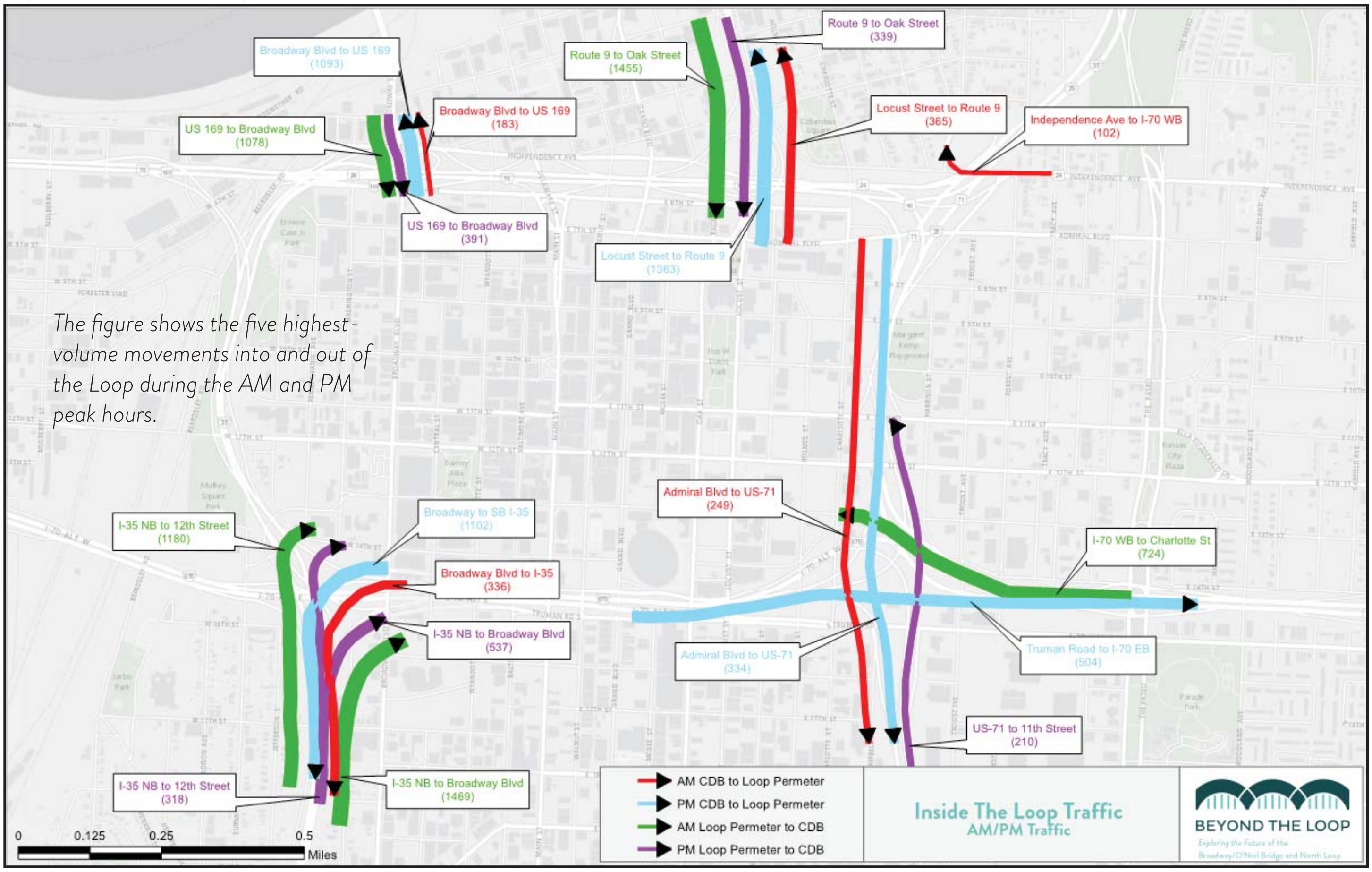
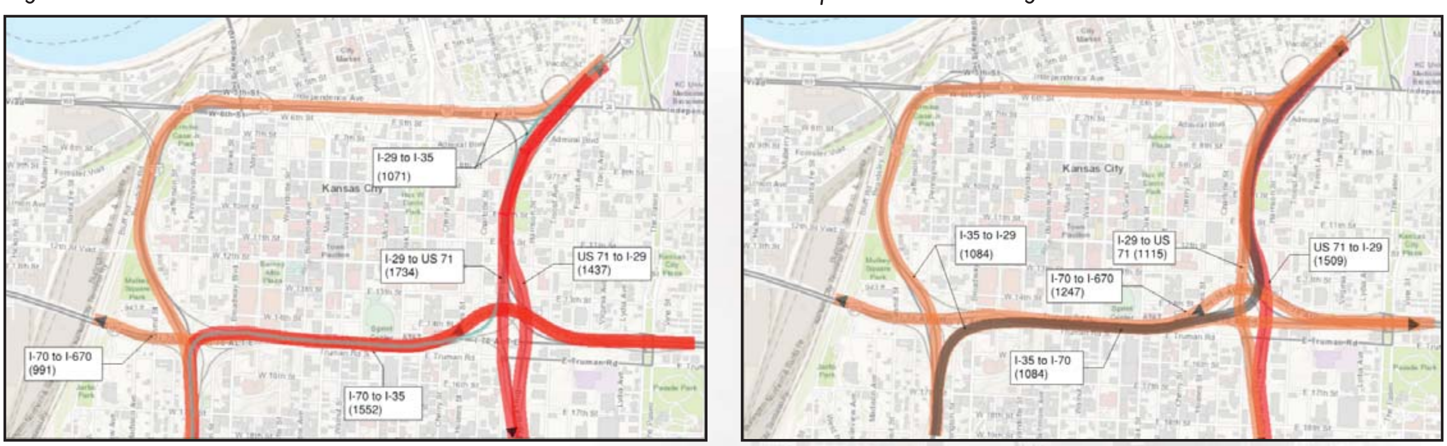


Figure 2.13 - Five Heaviest External to External Routes - AM Peak (left) & PM Peak (right) - 2017



The five heaviest AM peak hour system-to-system routes in terms of vehicular volumes are:

- *I-29 (NE Corner) to Hwy 71 (SE Corner) – 1734 vehicles*
- *I-70 (SE Corner) to I-35 (SW Corner) – 1552 vehicles*
- *Hwy 71 (SE Corner) to I-29 (NE Corner) – 1437 vehicles*
- *I-29 (NE Corner) to I-35 (SW Corner) – 1071 vehicles*
- *I-70 (SE Corner) to I-670 (SW Corner) – 991 vehicles*

The five heaviest PM peak hour system-to-system routes in terms of vehicular volumes are:

- *Hwy 71 (SE Corner) to I-29 (NE Corner) – 1509 vehicles*
- *I-70 (SE Corner) to I-670 (SW Corner) – 1247 vehicles*
- *I-29 (NE Corner) to Hwy 71 (SE Corner) – 1115 vehicles*
- *I-35 (SW Corner) to I-29 (NE Corner) – 1084 vehicles*
- *I-35 (SW Corner) to I-70 (SE Corner) – 1034 vehicles*

SAFETY

The safety assessment focused on understanding the magnitude and nature of the safety problems within the Study Area and relating crash causality to roadway geometrics and traffic operations. The analysis looked only at major roadways and omitted records for accidents occurring on local roads and streets.

Total Accidents

The analysis included the review of five years of accident reports (2010 to 2014) to assess trends in accident classification and accident severity. Within the Study Area there were a total of 5,898 reported crashes on the major roadways; 670 occurred on Kansas highways; and 5,228 on Missouri highways. Table 2.2 summarizes the reported crashes from 2010 to 2014 by severity.

Accident location maps were prepared to assist in identifying more specific areas with a high volume of incidents. The heat map in Figure 2.14 illustrates locations with increased incident frequencies and Figure 2.15 identifies the location of the injury only accidents. Six locations in or immediately adjacent to the Downtown Loop were identified with increased accident frequencies. These locations include:

- US-169 at the Downtown Airport Interchange
- US-169, I-70, and 5th Street Interchange
- North Side of the Loop
- East Side of the Loop
- I-35, I-670, and the Broadway Interchange
- I-70 Curve at Minnesota Avenue

Table 2.2 - Reported Crashes by Severity - 2010 to 2014

Accident Severity	Kansas	Missouri	Total
Fatal	7	20	27
Disabling	10	93	103
Minor Injury*	167	1,083	1,250
Property Damage Only	486	4,032	4,518
Totals	670	5,228	5,898

* Records for Kansas include the additional classification of possible injury. All accidents listed as possible injury have been transferred to minor injury for consistency with Missouri data.

Figure 2.14 - Accident Density

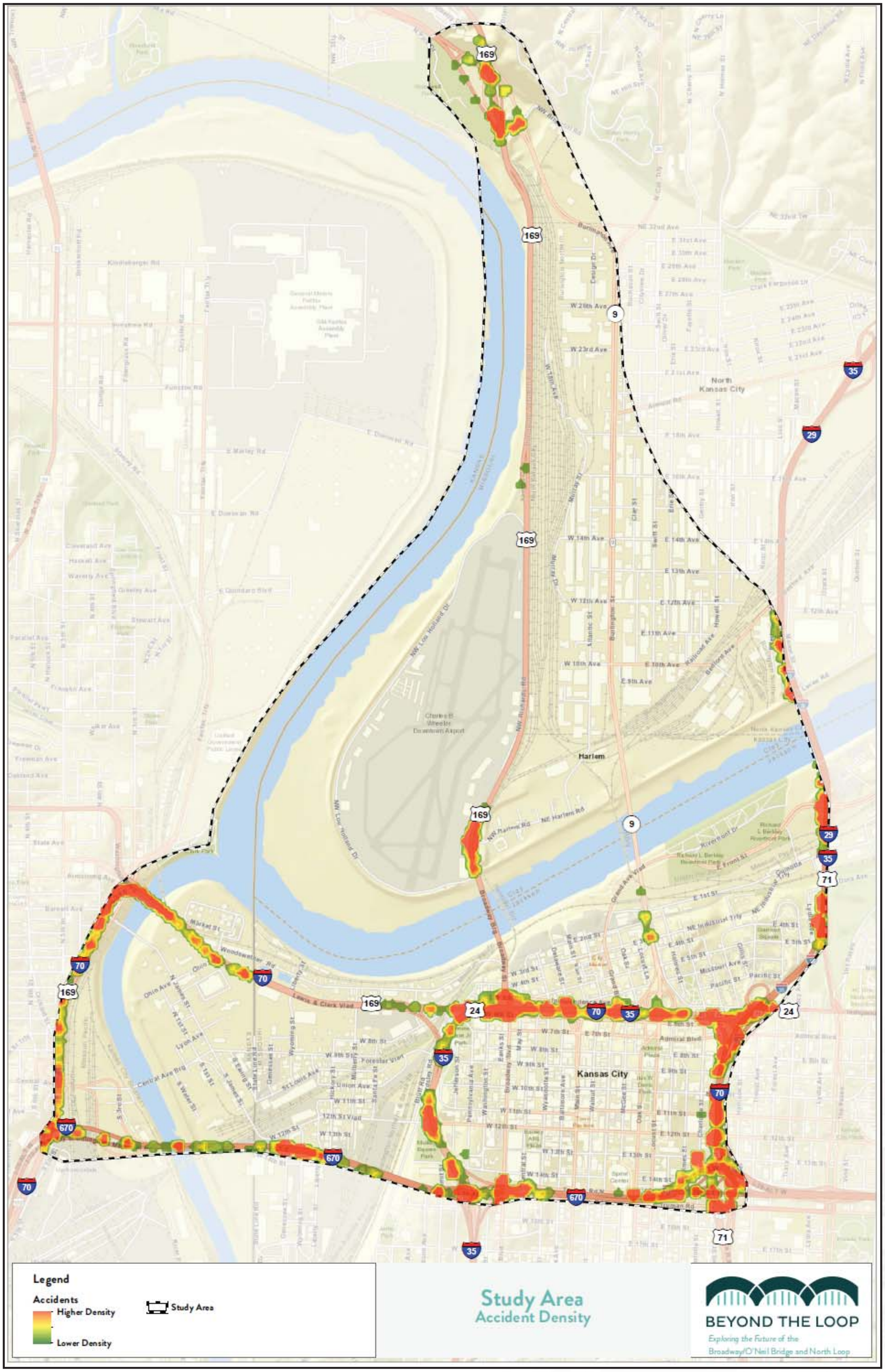
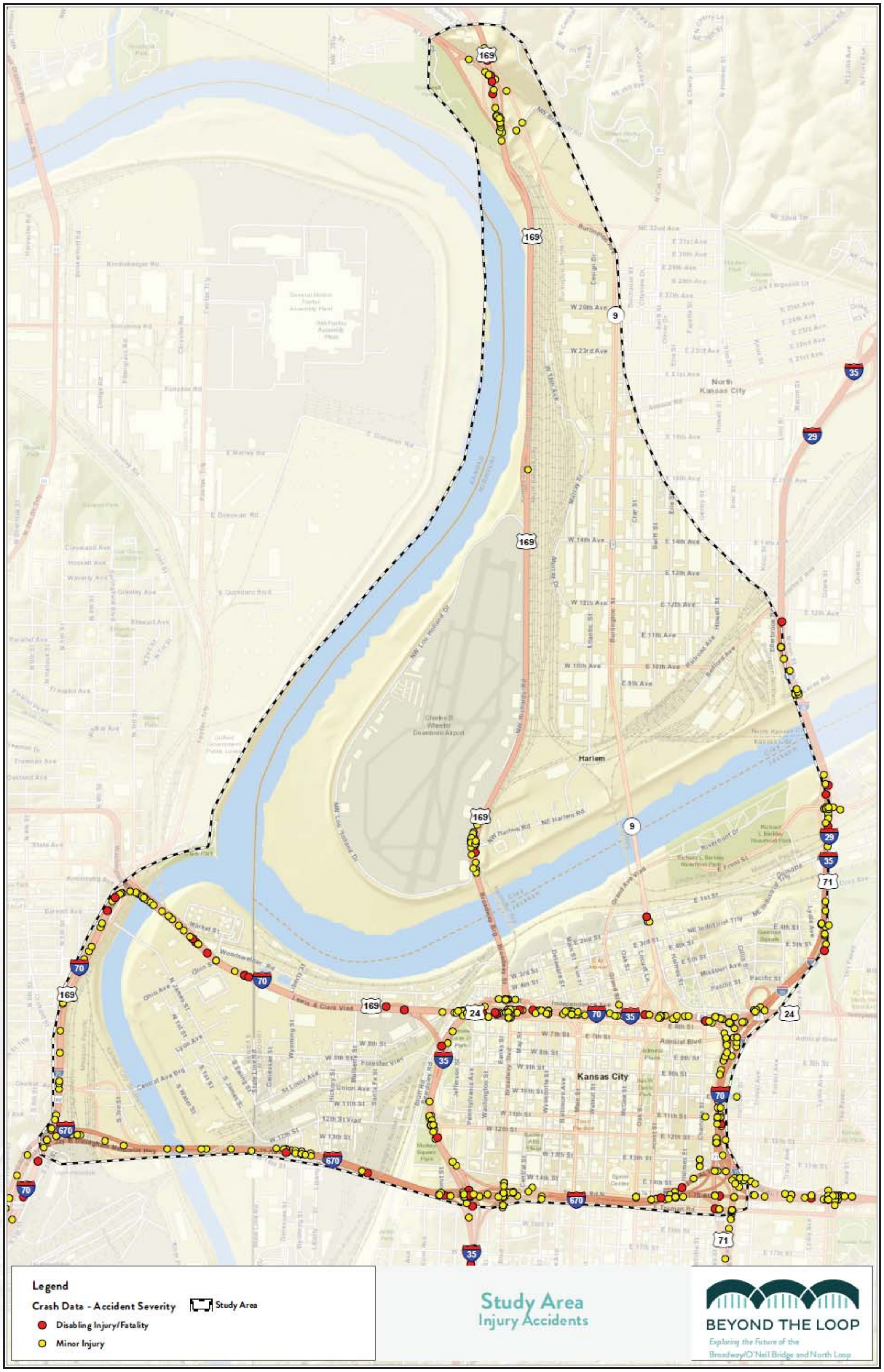


Figure 2.15 - Injury Accidents



Average Crash Rates

Crash rates are a common measure used when analyzing safety statistics for highways to gauge the overall safety performance of a roadway segment. Crash rates are calculated by totaling the number of incidents occurring per hundred million miles traveled over a specific segment length.

- Kansas — A two-year average crash rate was compiled for each major corridor segment in the Kansas portion of the Study Area. The data, Table 2.3, notes the segment of I-70 from US-169 to the state line exceeds the comparable statewide average for 6-lane urban freeway facilities in Kansas.
- Missouri — A three-year average crash rate was compiled for the Missouri portion of the Study Area. The data in Table 2.4 illustrates all four sides of the Downtown Loop exceed the comparable MoDOT Kansas City District average, and in some segments, are more than triple the rate.

Table 2.3 - Average Crash Rates, Kansas

Route	Location	2-Year Average Crash Rate	Comparable Crash Rate for Kansas Urban Freeways
I-670	I-70 to State Line	73	138
I-70	I-670 to US-169	81	138
I-70	US-169 to State Line	151	138

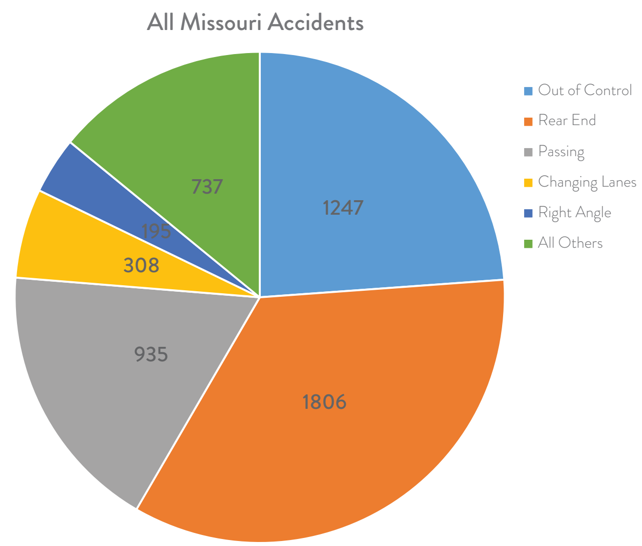
Table 2.4 - Average Crash Rates, Missouri

Route	Location	Direction of Travel	3-Year Average	Comparable Crash Rates for the Kansas City District
I-70	North Side of Loop	East	359	138
I-70	North Side of Loop	West	361	138
I-70	East Side of Loop	North	269	138
I-70	East Side of Loop	South	411	138
I-670	South Side of Loop	East	213	138
I-670	South Side of Loop	West	205	138
I-35	West Side of Loop	North	235	138
I-35	West Side of Loop	South	411	138
US-169	Broadway Extension	North	116	129
US-169	Broadway Extension	South	147	129
Route 9	Burlington Corridor	North	162	137
Route 9	Burlington Corridor	South	225	137

Accident Causality

An accident classification breakdown was completed at each high accident location. The accident classification indicates the primary contributing cause to the incident as recorded by the policing agency. Rear-end, passing and changing lanes are the predominant accident classifications for each of the six locations. Driving too fast for conditions and incidents related to weather, which are included under out of control accidents, were also frequently noted as a contributing factors.The large percentage of rear-end, passing, and lane-changing accidents are often a result of higher congestion levels or deficient roadway geometrics such as poor sight lines, short merging areas, and high volumes of weaving movements.

Figure 2.16 - Accident Causality, Missouri and Kansas



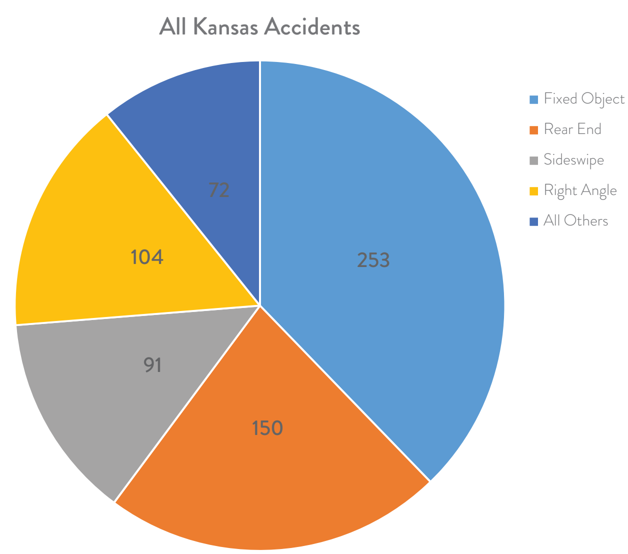
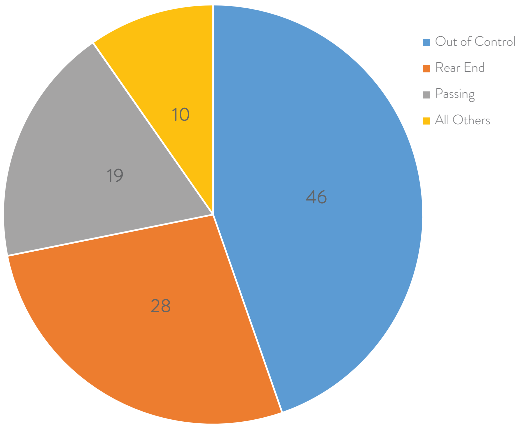
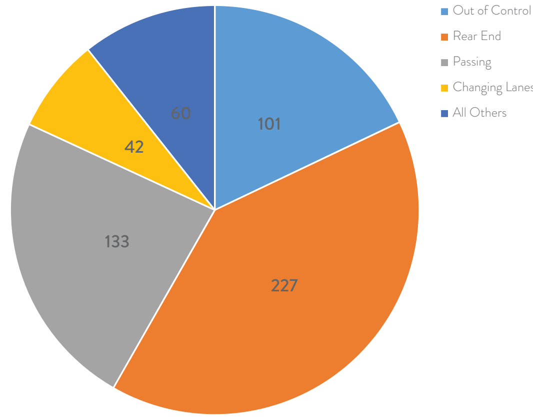


Figure 2.17 - Accident Causality, Top Six Locations

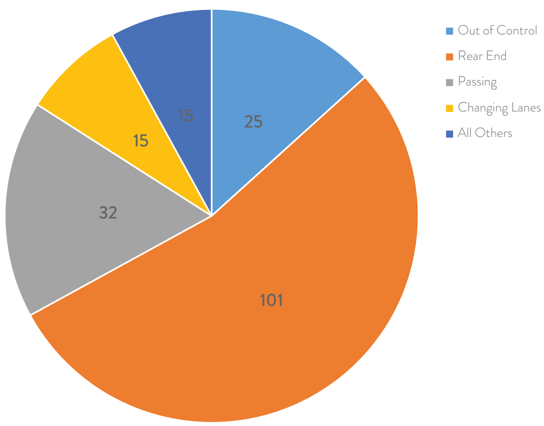
US-169 (Broadway) at the Downtown Airport Interchange



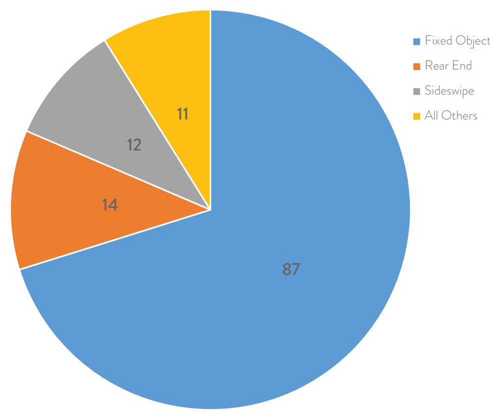
East Side of the Loop



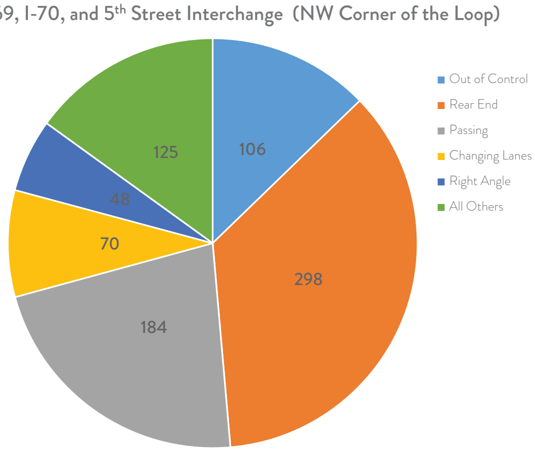
North Side of the Loop



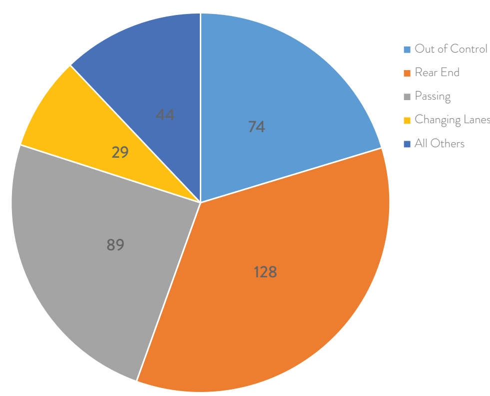
I-70 Curve at Minnesota



US 169, I-70, and 5th Street Interchange (NW Corner of the Loop)



I-35, I-670, and Broadway Interchange (SW Corner of the Loop)



TRANSIT

The Study Area traverses the heart of downtown Kansas City. Many transit lines run through the Study Area and the information that follows briefly summarizes these routes.

Local Bus Routes

Local bus lines make stops throughout the Study Area. KCATA offers variations of the routes as depicted in Figure 2.18 during weekend periods. Downtown Kansas City is currently served by 42 KCATA and eight Johnson County Transit bus routes, designed primarily to transport workers into and out of downtown. Travel demands changed with the development of new convention, sporting and cultural facilities, the Power and Light District, and more people moving downtown and travel demands will continue to change in the future.

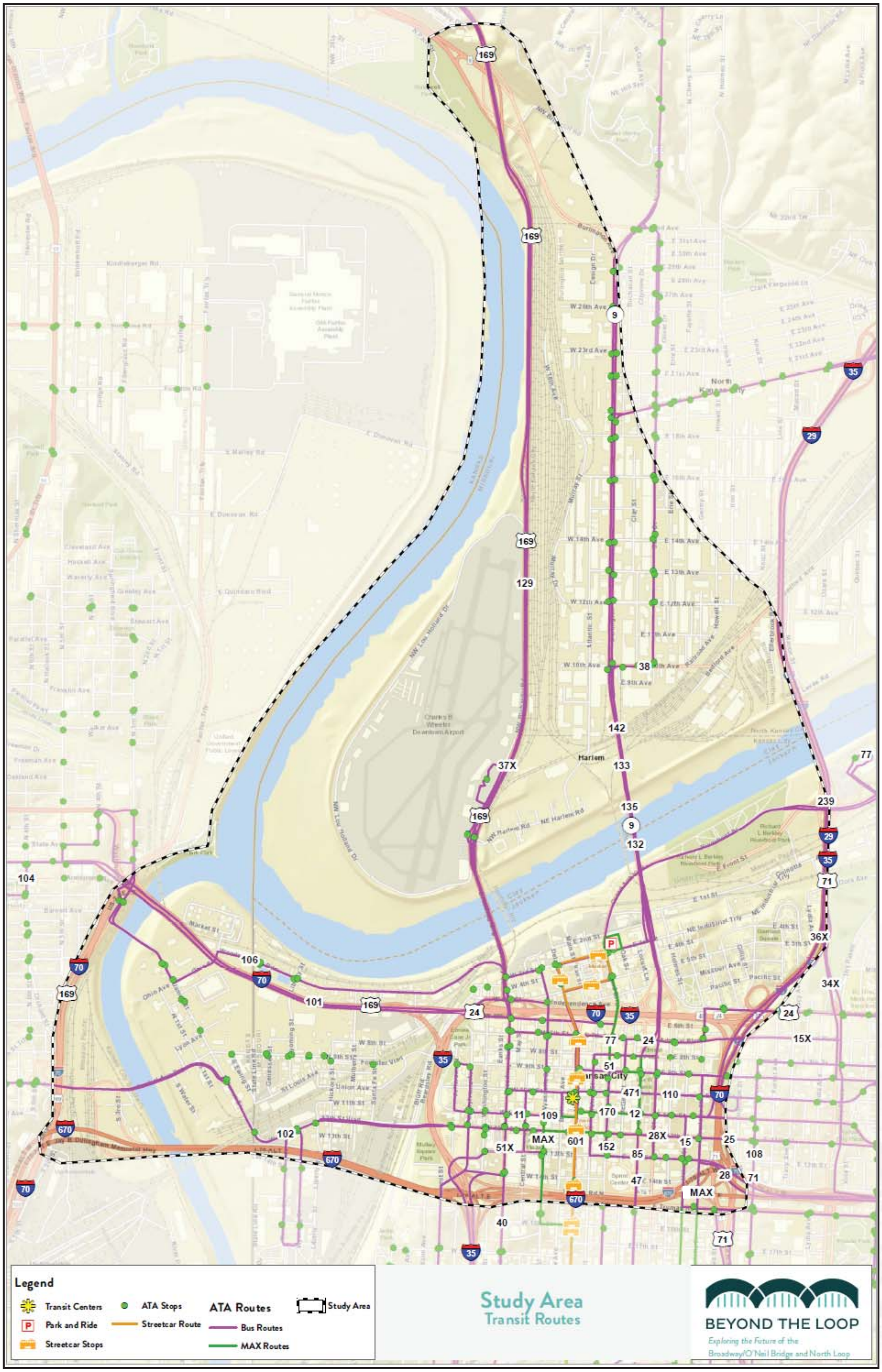
MAX Bus Routes

MAX lines developed by KCATA provide bus rapid transit (BRT) service in the region. BRT routes are priority routes and include passenger amenities such as zero-entry boarding, Wi-Fi, and enhanced station stops. Main Street MAX provides north/south service through the heart of Kansas City originating at the River Market area, extending south to Waldo. Stops within the Study Area include Grand Avenue and 3rd Street in the River Market, Grand Avenue and 5th Street, Grand Avenue and 8th Street, and Grand and 9th Street. Park and ride facilities along with transfers to other KCATA services are available at the Grand Avenue and 3rd Street stop in the River Market. KCATA is currently considering moving the Main Street MAX route to Grand Avenue based on overlap with the KC Streetcar Main Street route.

Streetcar

KC Streetcar debuted in 2016 and provides fixed-route transit services along a 2-mile north/south corridor extending from the River Market area to Crown Center. Stops include 3rd and Grand Avenue, 4th and Delaware Street, 5th and Walnut Street, 7th and Main Street, and 9th and Main Street. Park and ride facilities along with transfers to KCATA services are available at the Grand Avenue and 3rd Street stop in the River Market. A feasibility study was recently completed that examined the potential extension of the existing streetcar line from 3rd and Grand to the Riverfront. In addition, a team has been selected to study the potential extension of the existing streetcar line from Union Station to the Country Club Plaza/UMKC area.

Figure 2.18 -Study Area Transit Services



BICYCLE AND PEDESTRIAN FACILITIES

Existing Bicycle Facilities

Numerous signed bike routes exist along the City of Kansas City roadway network. Bike routes crossing the north side of the Downtown Loop include Charlotte Street, Grand Boulevard and Wyandotte Street. Major connecting east/west oriented bike routes in the region include 3rd Street north of the Downtown Loop and 11th and 12th Streets south of the Downtown Loop.

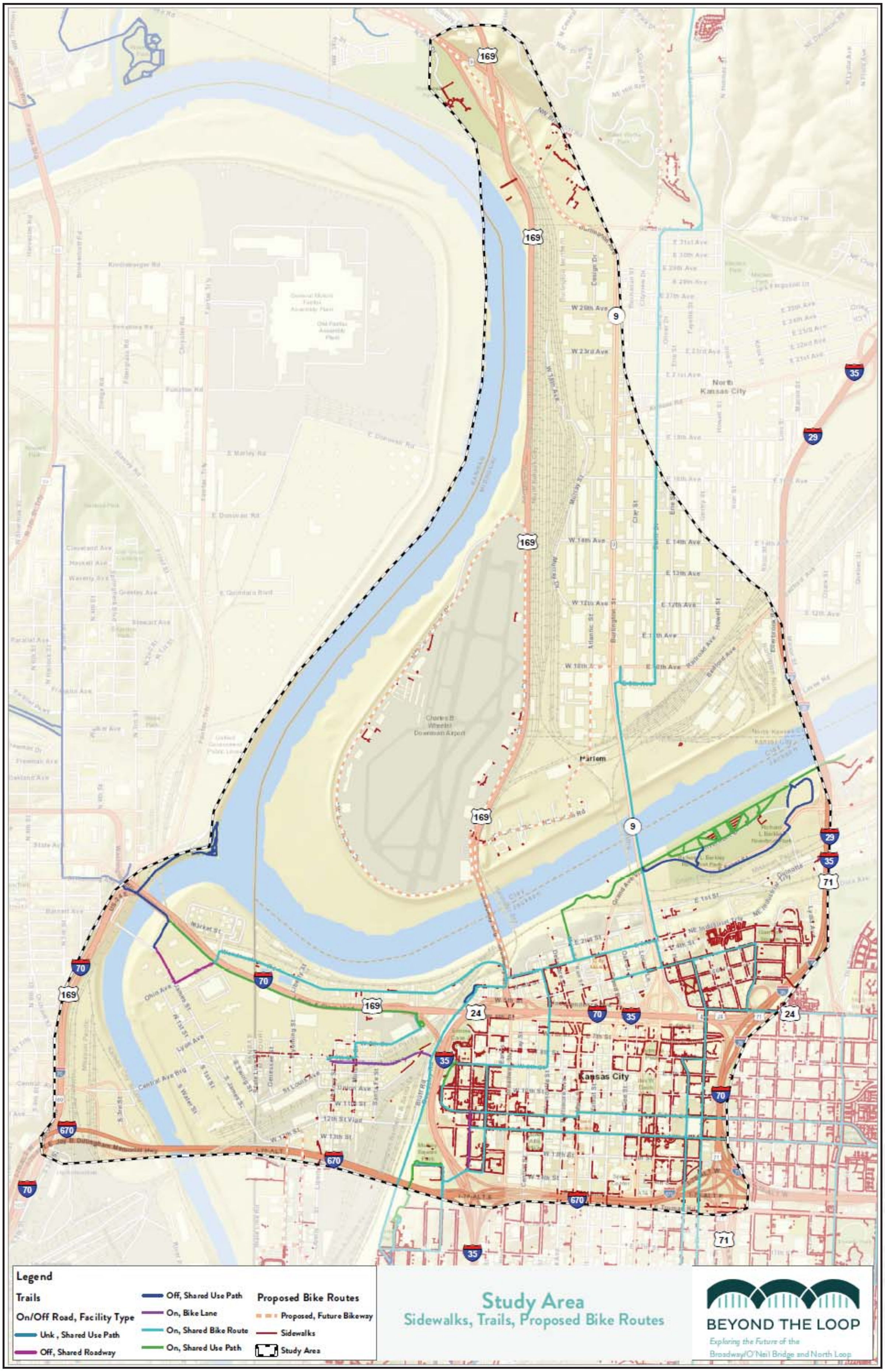
Two multi-use trail segments are available allowing bicyclists to cross either the Kansas River or Missouri River. A barrier-separated multi-use path is available on the Heart of America Bridge (Route 9) which crosses the Missouri River and the Riverfront Heritage Trail crosses the Kansas River as an attached pedestrian facility to the I-70 eastbound bridge. The existing Buck O'Neil Bridge is a highly desired bicycle route that is for the most part inaccessible under the current conditions. The City of Kansas City is in the process of updating the Bike KC plan. The goal for completion of the updated plan is March 2018.

Existing Pedestrian Facilities

Many of the surface streets within the study area have pedestrian facilities on one or both sides, with isolated gaps spread throughout. The City of Kansas City and MoDOT are progressing with ADA transition plans and while many deficiencies have been addressed at curb cut locations, excessive cross slopes and width restrictions are present on nearly every segment of sidewalk. Pedestrian activated push buttons at signalized intersections are being modified to meet ADA requirements as part of the ADA transition planning process.

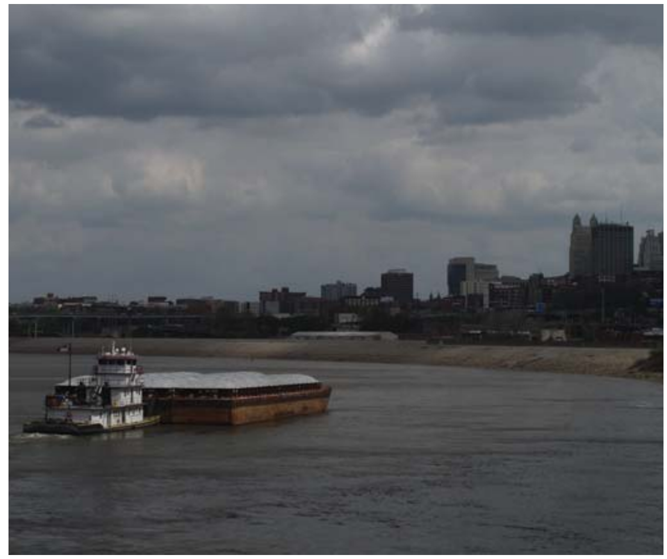
In addition to the previously mentioned Heart of America Bridge multi-use path and Riverfront Heritage Trail, there are five local streets that bridge the north side of the Downtown Loop, and one highway crossing. All five local street crossings have dedicated pedestrian access and connect into the City of Kansas City sidewalk system. The Grand Avenue crossing is the only local street, however, that has pedestrian accommodations exceeding four feet in width. The highway crossing, Missouri Route 9 (Oak Street), is not designed for pedestrian access and is configured as a higher speed roadway with a shoulder section.

Figure 2.19 - Existing Bicycle and Pedestrian Facilities



MISSOURI RIVER NAVIGATION

The Missouri River is classified as a navigable waterway. The Missouri River traffic within the navigational channel, located next to the south bank of the river, is regulated and maintained by the United States Coast Guard (USCG) within the Study Area. In 1884, to facilitate navigation the modification of the Missouri River became a federal responsibility. In 1912, Congress authorized the stabilization of banks and deepening of the channel for a 6-foot-deep and 200-foot-wide channel benchmark. In 1945, the authorized channel depth and width benchmark for the Missouri River navigational channel was increased to 9-feet deep and 300-feet wide. The existing O'Neil Bridge has a 540-foot span between piers and a total of 500 feet dedicated to the navigational channel (Figure 2.20).



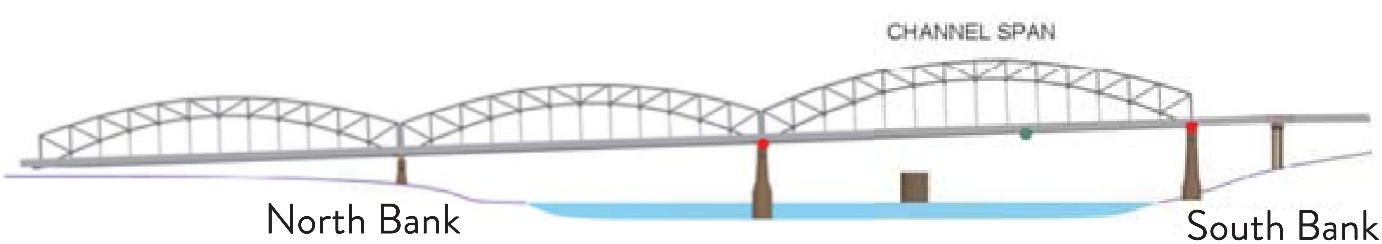
Located just upstream of the existing O'Neil Bridge, PortKC has just begun shipping freight down the Missouri River. Any proposed improvement to the O'Neil Bridge will require compliance with USCG regulations on navigation span lengths and vertical clearances.

The navigational channel is used by commercial, recreational and other watercrafts. The length of the Missouri River's navigation season varies by location and type of use. Recreational use (e.g., fishing) of the Missouri River, takes place throughout the entire year. Port of Kansas City - Woodswether Terminal (Port KC) is Kansas City's multi-modal connection for waterborne, rail and interstate highway commerce. The normal navigational season length for PortKC from the Missouri River is eight months long (March 28th to November 27th). In years of greater than normal water supply the navigation season is extended to December 7th. PortKC welcomed its first barge in August 2015. PortKC is located at river mile 367.1 just upstream of the existing O'Neil Bridge.

Port KC currently consists of facilities on approximately 9 acres upstream of the existing O'Neil Bridge capable of barge and truck loading, as well as the capacity to store 650,000-750,000 tons of materials. The facility is currently completing a design-build project that will accommodate additional storage with a projected increase of 4 barges/month for a total of 8 barges/month anticipated. Most, if not all, of these materials will be hauled from the facility via truck and add additional truck traffic within the Study Area. PortKC's goal is to move approximately 500,000 tons/year of materials by truck. PortKC has a Strategic Plan produced in 2010 that is getting ready to be updated.

Water Body	Existing Condition
River Mile	366.2
Channel Span	540'
Navigation Channel	500'
Vertical Clearance	86.2'
CRP Stage	10'
CRP Elevation	716.7'
CRP Clearance	88.7'

Figure 2.20 - Existing Span Details for Existing O'Neil Bridge



RAILROADS

Four Class I Railroads, the largest class of railroad operators in the United States, operate within the Study Area. Union Pacific (UP), and Burlington Northern Santa Fe (BNSF) both have extensive operations in the Kansas City region, with Kansas City Southern (KCS) and Norfolk Southern (NS) also providing service.

Four bridges are in use to provide rail crossings of the two major rivers in the region. The UP operates two bridges crossing the Kansas River and the BNSF has two facilities crossing the Missouri River. Both BNSF Missouri River crossings are nearby and parallel either the US-169 Buck O'Neil Bridge or the Route 9 Heart of America Bridge.

Figure 2.21 -Railroads

AIRSPACE

The Charles B. Wheeler Downtown Airport is a city-owned, public-use airport serving Kansas City, Missouri. The facility is included in the National Plan of Integrated Airport Systems and is categorized as a general aviation, reliever airport.

The airport replaced Richards Field as Kansas City's main airport and was dedicated in 1927 by Charles Lindbergh and was soon renamed Kansas City Municipal Airport. The airport was built in the Missouri River bottoms next to the rail tracks at the Hannibal Bridge. At the time air travel was considered to be handled in conjunction with rail traffic.

The airport had limited area for expansion and airplanes had to avoid the 200-foot Quality Hill and Downtown Kansas City skyline south of the south end of the main runway. In the early 1960s an FAA memo called it "the most dangerous major airport in the country" and urged that no further federal funds be spent on it. Kansas City replaced the airport in 1972 with Kansas City International (KCI) Airport.

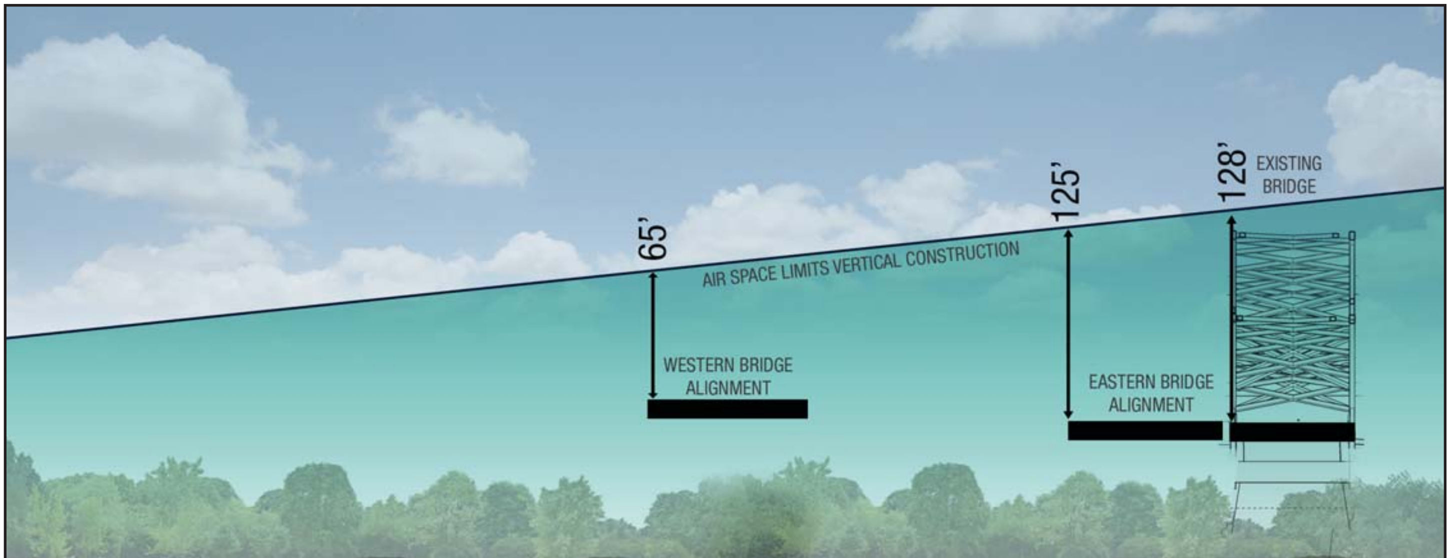
The downtown airport has been renamed for Charles Wheeler who was mayor when KCI opened. Despite concerns about the airport being unsafe, Air Force One frequently uses it during presidential visits. Today the airport is used for corporate and recreational aviation. The terminal building currently houses VML, a global advertising and marketing agency.

The Downtown Airport covers an area of 695 acres at an elevation of 757 above mean sea level. It has two runways: 1/19 is 6,827 by 150 feet with a concrete surface and an engineer materials arrestor system at both ends. 3/21 is 5,050 feet by 100 feet with an asphalt surface. For a 12-month period ending September 30, 2011, the airport had 67,793 aircraft operations, an average of 185 per day.

The proximity of the existing O'Neil Bridge to the downtown airport could limit the potential improvement options available as any proposed strategy will need to comply with FAA requirements for safe airport operations.

Given the proximity of the study area to the Downtown Airport, any improvement strategy will require formal notice and review for airspace considerations under Federal Aviation Regulation (FAR) Part 77, Objects Affecting Navigable Airspace. As illustrated in Figures 2.22 and 2.23, the ultimate height of any new Missouri River structure will be limited by the available airspace.

Figure 2.22 - Airspace Limitations for New Bridge (North Bank)



On the North Bank of the MO River, the airspace limitations range from 65 to 125 feet above the bridge deck depending on how far west a new bridge alignment extends

Figure 2.23 - Airspace Limitations for New Bridge (South Bank)

Similarly, on the South Bank of the MO River, the airspace limitations range from 75 to 135 feet above the bridge deck depending on how far west a new bridge alignment extends.

UTILITIES

The study area contains numerous utilities including electrical distribution, electrical transmission, highway and street lighting, private and public communication facilities, gas, chilled water, sanitary sewer, storm sewer, and water. The project team obtained utility information from previous projects conducted in the Study Area, the City of Kansas City Public Works Department including the Capital Projects Office, the City of Kansas City Water Department, and providers for electrical and communication services. MoDOT facilities including communication and lighting services were obtained from existing plans and previously conducted surveys.

Based on the information available the project team developed the following listing of utilities in the Study Area. Some of these utilities are highlighted on Figure 2.21. This listing is not intended to address every known utility within the Study Area but focuses on facilities that could impact the evaluation of potential strategies.

US-169 Northbound

- KCPL has a 161 kv transmission line and a 13.2 kv distribution line running parallel to and near the south bank of the Missouri River.

NW Corner of the Downtown Loop & US-169

- KC Water has an underground 90-inch diameter water line beginning west of I-35 and 12th Street, running under the northwest corner of the Downtown Loop and US-169 before heading east along the Missouri River. The water line crosses under the Missouri River west of Route 9.

Interstate Facilities

- KDOT and MoDOT have fiber optic facilities within the right-of-way along all four legs of the Downtown Loop and the approaching interstate routes. Continuous lighting is in place along all the interstate roadways in both Kansas and Missouri.

North Side of the Downtown Loop

- KCP&L has a 13.2 kv distribution underground electric line crossings west of Walnut Street and east of Route 9.
- MGE has a 16-inch diameter underground gas line east of Walnut Street.
- Kansas City Water has five underground water line crossings along the north side of Loop ranging from 4 to 20 inches in diameter.
- Veoila Energy has a 24-inch underground chilled water line crossing near Delaware Street and a 14-inch underground chilled water line crossing near Grand Avenue.
- Kansas City Public Works has eight underground sanitary storm sewer facilities crossing the north side of the Downtown Loop ranging from 15-inches to 78-inches in diameter.
- Kansas City has an underground fiber optic line and conduit crossing I-70 at Charlotte Street.

East Side of the Downtown Loop

- Kansas City has an underground fiber optic line running along the west side of I-70.
- Kansas City has an underground fiber optic line and conduit crossing I-70 at 12th Street.

West Side of the Downtown Loop

- KCMO Public Works has a 48-inch underground sanitary sewer line within the I-35 right-of-way from 12th Street north to St. Louis Avenue.
- KCMO Public Works has a 36-inch underground sanitary sewer line within along I-35 from St. Louis Avenue north to the I-35/I-70 interchange.
- KCPL has a major overhead transmission line which originates near the Missouri River and heads south crossing I-70 overhead slightly west of the interchange with I-35. The line continues south near the western right-of-way limits for I-35 before leaving the Study Area.

South Side of the Downtown Loop

- Kansas City Water has two underground water line crossings on the south side of the Downtown Loop, both near Baltimore Street.
- KCPL has two -13.2 kv electrical line crossings of the south side of the Downtown Loop, one at Main Street and the other just east of McGee Street.
- MGE has a 20-inch diameter encased underground gas line crossing at Walnut Street.

Northwest Corner of the Study Area (I-70 Curve at Minnesota)

- Kansas City Kansas Board of Public Utilities (BPU) has a 20-inch underground water line crossing under the I-70 interchange complex.
- Kansas Gas Service has a 6-inch underground high-pressure line crossing under the I-70 interchange complex.

Figure 2.24 - Existing Utilities